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ABSTRACT

PLATO IV (Programmed Logic for Automatic Teaching Operations) is the fourth generation of a computer assisted instructional system developed at the University of Illinois. The use of PLATO IV at five community colleges, and an evaluation of its educational impact on participating students, instructors, and colleges are described. The PLATO system was found to be operating essentially as planned by its developers. The system provided a medium for instruction with substantial appeal to both students and instructors, but it had no consistent positive nor negative effects on student achievement nor attrition. The cooperative effort between instructors and developers was successful in that a substantial number of PLATO lessons were designed, developed, and integrated into ongoing community college courses in the five targeted subject areas: accounting, biology, chemistry, English, and mathematics. The usage of PLATO by students and instructors exceeded initial expectations although the extent of usage in classes was somewhat less on the average than had been projected originally. According to the evaluators, the critical factor which accounted for the high acceptance and usage of PLATO was the control that instructors had over its use. The attitude surveys and tabulated results are appended. (Author/GDC)

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Richard T. Murphy
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EDUCATIONAL TESTING SERVICE
PRINCETON, NEW JERSEY

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Educational Testing Service
Princeton, New Jersey 08540

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NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C.

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Chapter 1

Introduction to The Evaluation

1.1 The PLATO System

PLATO (Programmed Logic for Automatic Teaching Operations) is the term used to describe the specific computer-based education system developed at the Computer-based Education Research Laboratory (CERL) in Urbana, Illinois. The primary purpose of the system is to deliver instruction to students in an interactive manner through the use of student terminals located at sites at varying distances from the central computer. The PLATO system may be considered in a narrow sense to include the hardware system and the software essential to its functioning. More broadly, the PLATO system may be considered as including specific lessons in a variety of courses, the support services available at the central computer site and the local sites, the participating instructors, liaison staff, and written materials that describe the available lessons and the programming language (TUTOR). In this report, the PLATO system is considered in this latter, more comprehensive, sense as it applies to the community college project.

PLATO has developed through four stages, and the fourth stage (PLATO IV) is the system that has been implemented and demonstrated in this project. The fifth stage (PLATO V) is under development at present. The following brief description of the development of the first three stages is given in Alpert and Bitzer (1970):

> The computer can be a valuable tool in the presentation of drill and practice routines in fields like elementary mathematics and vocabulary development. A capability for such programs was provided by the earliest and most limited system, PLATO I. PLATO II provided a more expanded tutorial capacity. The most important consequences of these two systems, however, were their stimulation of research and development leading to the broader capabilities of PLATO III, which was designed for optimum educational versatility without specific concern for costs.

PLATO III, utilizing a large second-generation computer, was capable of supporting, at any one time, 20 of 72 terminals linked to the system. In 1968, the developers designed the PLATO IV system to serve 4,000 student terminals. It was expected that the use of this large number of student terminals would result in a low cost per student hour and therefore an economically feasible system. For reasons that will be explained, PLATO IV has operated with approximately 1,000 student terminals in the system. The PLATO V system will include smaller student terminals with built-in microprocessors and the capability of storing special programs directly in the student terminals. A model of the PLATO V student terminal is in operation at present in the Computer-based Education Research Laboratory.

The hardware of the PLATO IV system includes the central computer, a Control Data Corporation Cyber 73-24, capable of performing approximately four million instructions per second. Information from the PLATO III system indicated that the average request rate was approximately one request per four seconds per terminal. If the central computer allowed one millisecond of computer execution time per request on the average, then the system would be able to serve 4,000 terminals. In addition, the PLATO III system had indicated that each student would need an average of 500 words of dedicated extended core memory. Therefore the central computing facility was designed to have two million (sixty-bit) words of extended core storage (ECS) in order to service 4,000 student terminals. Finally, the central processing unit (CPU) would have to be sufficiently large (65K-128K words) to allow for storage and handling of lessons being utilized in its high-speed core memory unit. These projections were based on two assumptions which were not met in the implementation and demonstration. It was assumed that (1) the student terminals would be distributed in groups of 32, and (2) the students using the terminals in a group would all study the same few lessons at the same time. The facts that the student terminals were distributed in much smaller groups and were used independently of one another resulted in the PLATO IV system's ability to service 1,000 terminals rather than the originally projected 4,000.

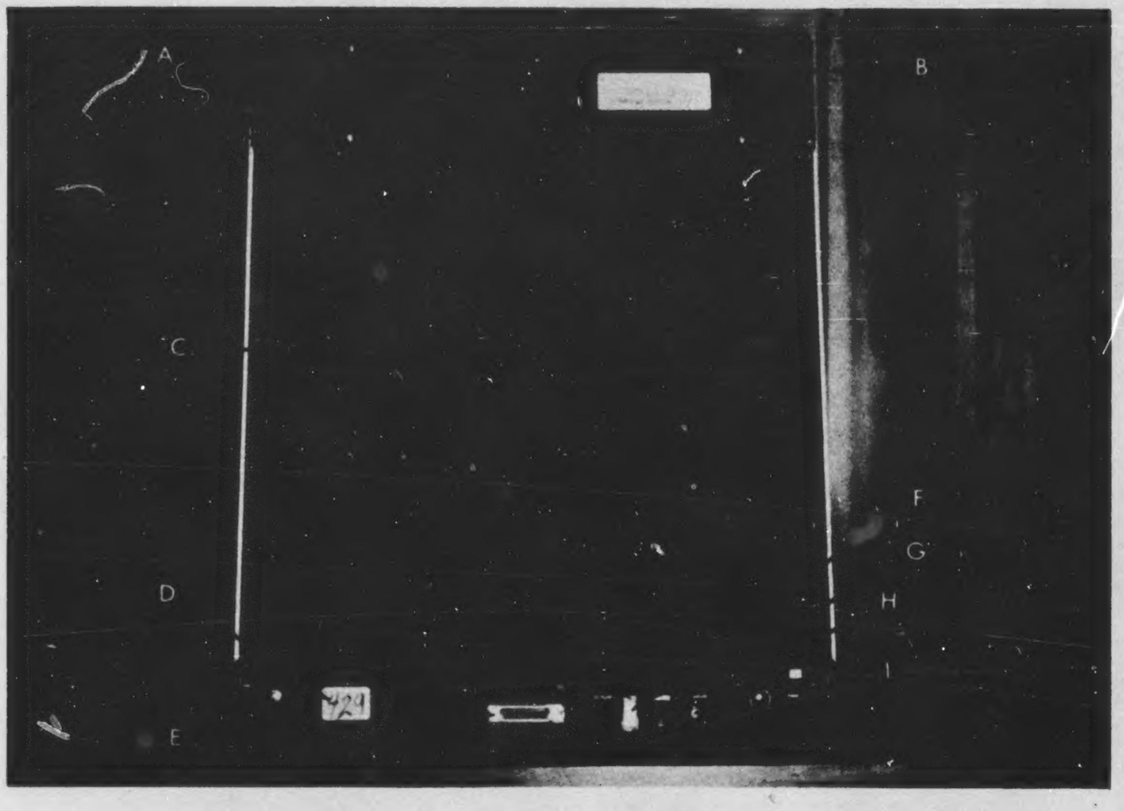
In addition to the two assumptions described above not being met, increased courseware authoring beyond what had been projected also caused a reduction in the number of terminals that could be supported by the system. The reason for this reduction is explained in the following statement (personal communication from R. A. Avner, CERL, 1977) made in response to an initial draft of this report:

> The two assumptions not met are only part of the reason for 1,000 rather than 4,000 terminals (they cover only storage space). On the matter of space, it was assumed that a limited amount of material would be available. Thus, the average lesson would be used by about 10 students (the estimated average lesson size of 5,000 words is still fairly accurate--but the number of lessons ballooned beyond all expectation so the likelihood of lots of students in the same lesson became very small in reality). The increased courseware authoring mentioned is the direct cause of this problem in space. Lessons were produced far more rapidly than expected--mostly because authoring turned into a far more attractive venture than had been anticipated. A third assumption that was not met (and not mentioned in the report) was the amount of computing power required. In the early designs, it was expected that simple routing and calls for slides would take up most of the processing time needed. However, with the advent of TUTOR toward the end of PLATO III it became evident that sophisticated simulation and response processing could be done by a fairly large proportion of authors and formed a very attractive application of the computer. Hence, there was an evolutionary shift toward support of capabilities requiring heavier processing support. While the number of keys entered by students continued to be within the design range, the amount of processing as a result of the new applications was substantially higher than the original design had anticipated and permitted support of fewer terminals.

The student terminal consists essentially of a plasma panel for displaying instructional material to the student and a special keyset (similar to an electric typewriter) which the student uses to interact with the system. Pictures of the front of the terminal and the keyset are given in Figures 1.1 and 1.2. These pictures and descriptions are reproduced from Using PLATO IV (Meller, 1974).

Figure 1.1

Student Terminal



The dimensions of the terminal are 18 3/8" wide, 23 1/8" high, and 25 5/8" deep. (These are the greatest outside dimensions.) The parts of the terminal identified in Figure 1.1 are explained below.

A. Microfiche Access Door: Open the door, and the slide selector will automatically position itself so you can insert or remove a microfiche.

B. Focus Knob: Move the knob up and down to focus a slide on the screen.

C. Screen: The plasma panel, which displays characters and graphics, is the most commonly used output device.

D. Serial Number: This number identifies the terminal for administrative and maintenance purposes.

E. Keyset Connector: The cable from the keyset plugs in here. The keyset is the most commonly used input device.

F. Terminal Clear Switch: This switch is spring-loaded and returns to its normal position after being activated. It resets all the circuitry in the terminal and erases the screen.

G. Error Reset Switch: This switch is also spring-loaded and resets the circuitry that indicates a non-correctable communication error occurred.

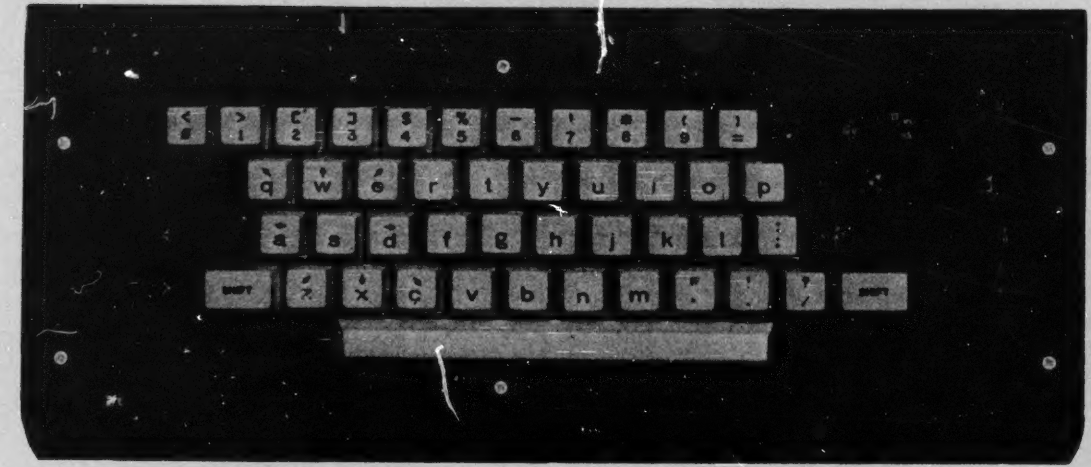
H. Error Light: The error light is the visual indicator of communication errors.

I. Power Switch: The power switch turns the terminal on and off.

The microfiche slide projector is capable of projecting 256 color images from a single microfiche. Some display panels are sensitive to touch thus providing an additional mode of interaction by the student with the system. An audio device may be connected to the terminal to provide aural material synchronized with the displayed material.

Figure 1.2

Keyset



The keyset is very similar to a standard typewriter keyboard. The keyset consists of 64 physical keys which represent alphabetical, numerical, punctuation, and special-purpose characters and function keys. There are 126 standard characters and another 126 programmable characters, all of which can be accessed from the keyset.

The keyset is the most commonly used input device. Speed-typing ability proves useful to some authors, but students seldom feel the need to more than "hunt-and-peck" since most answers require a small number of keypresses. Additionally, the keyset is extremely versatile because it can be programmed to input complex answers from only a few student keypresses. For example, two keypresses can represent, i.e., can cause to be displayed, any of the following: a capital letter; a character of any foreign alphabet; the standard symbol for a note of music; the drawing of a nickel, dime, etc.; a chain of atoms showing the chemical bonds; a symbol for a capacitor, resistor, etc.; and anything else you can represent by a pattern of dots on the screen.

The PLATO IV system uses a unique programming language called TUTOR. Using this language, an author can program a lesson to display text, line drawings, animations, request PLATO to calculate for the student, analyze student responses, and offer various sequencing operations.

Although the PLATO hardware and courseware (instructional materials) are necessary elements for a functioning PLATO IV system, they are not sufficient. The system requires an underlying array of software for its operation. The PLATO software directs the operation of the system. It provides the means for monitoring the system and each student in the system; for insuring the security of courseware and student information against tampering and accidental loss; for permitting communication between student terminals; and for collecting, storing, and summarizing on-line data. The PLATO system is programmed in such a way that every keypress is processed by the central computer. Therefore, theoretically, every keypress for every student could be collected and stored. Practically, however, limitations of storage space require decisions to be made about what information to retain. In general, the amount of time that the student spends on the system is routinely collected and retained. Other student data collected depend on the commands programmed into specific lessons and vary from lesson to lesson. The software provides the means for summarizing and analyzing these data.

The PLATO system described thus far is common to all applications of PLATO in the elementary school, community college, and university. In the remainder of the report, the description of the PLATO system will be focused on the PLATO IV Computer-based Education System as implemented and demonstrated in the community colleges.

1.2 Community College component

The thrust of the community college implementation and demonstration was to test the PLATO system in a real-world setting closely resembling the way in which the developers intended the system to be used in future applications. Four of the participating colleges were far enough away (150 miles) from the central computer to allow for a fair test of the communication system using telephone lines. Although several subject areas were targeted for the implementation and demonstration, instructors and students were not preselected for participation. There was a strong commitment by the administrative staffs of the colleges, and state funds were invested to supplement the funds granted by the National Science Foundation. Nevertheless, instructor participation in the implementation and demonstration was voluntary. As a result, success was fundamentally dependent on attracting instructors to use the system. The developers (Statz, 1975) believed that a more conservative approach in local (Urbana) schools using preselected instructors, students, and instructional materials might have increased the probability of a successful implementation and demonstration, but such control would not have allowed the PLATO system to display all its capabilities. In addition, such an implementation and demonstration would not have had the generalizability achieved in the approach actually implemented. Although the plan chosen gave rise to problems in technical and human communication, they were problems that the developers wanted to try to solve rather than to ignore.

The context of the implementation and demonstration plan thus included remote sites which required somewhat long-range liaison work between developers and participants, instructors who were free to use the system as little or as much as they desired, instructors who were expected to cooperate in the development of instructional materials although they were not required to do so, a system which was flexible during the implementation and demonstration period with considerable modifications in software and instructional materials occuring, and new participating instructors who joined the project at various times during the implementation and demonstration period. These were considered realistic conditions for future implementations of the PLATO system and important for optimizing the generalizability of the demonstration project.

1.3 Goals of the PLATO community college project

Given the basic philosophy of the developers, that the PLATO IV system was to be implemented and demonstrated in cooperation with the participating community colleges and that specific applications of the system were to be significantly dependent on the interest and effort of participating instructors, it was consistent that goals be stated in more general terms than is often the case in implementing innovative educational programs. The developers were prepared to accommodate the interests of the instructors in the participating community colleges.

At the technical level, an obvious goal of the project was to achieve a reliable and efficient operational system. The 125 terminals assigned to the community college project represented only one component of the larger 1,000 terminal PLATO system. Implementation of the PLATO system had not been tried on such a large scale prior to the NSF implementation and demonstration. Estimates of the technical parameters had been made on the basis of several assumptions which were not met in the project. The extent of authoring use and of the variety of lessons used by students in specific sites had been underestimated. In spite of these underestimates, the data eventually collected show that the system worked very well technically.

A technically excellent system that was not used would hardly qualify as an interesting educational innovation. Therefore, a second goal of the developers was to achieve a specified amount of usage of the system by instructors and students. Five subject areas were targeted for usage: accountancy, biology, chemistry, English, and mathematics. The goal was to have the system used by approximately 300-400 students in each subject area in several of the participating colleges in each year of the two year demonstration period. This goal was surpassed as is explained in Chapter 2.

Other goals of the developers were not stated in explicit terms with criteria for assessing successful attainment. However, the developers did state the following set of questions which are similar to goal statements and which can be used to infer what they hoped would be achieved in the implementation and demonstration project.

1. Would the PLATO system be flexible and adaptable to the needs of students?
2. Would the system be capable of teaching many subjects to students and presenting instructional materials in a variety of ways?
3. Would the system be limited to off-the-shelf materials or would new materials really be developed by instructors and other staff in the participating colleges?
4. Would the system be able to provide individualized instruction for each student and remedial instruction when appropriate?
5. Would the system provide opportunities for staff and students to learn about computers and programming?
6. Would a communication system linking universities, community colleges, and public schools result from an implementation of the PLATO system?
7. Would the system provide opportunities for both stand-alone instruction and adjunctive applications to courses?
8. Would CERL subject coordinators be able to provide the support needed by the colleges to effect the implementation?
9. Could a partnership/cooperative arrangement for the production of course materials be implemented and would such an arrangement be effective?
10. Would the system provide adequate training for instructors in the use of TUTOR and in the application of PLATO courseware to their particular courses?

These questions were helpful to the evaluators in identifying outcome areas to be considered in the evaluation.

1.4 Purposes of the evaluation

The general purpose of the evaluation was to provide information for decision-makers in a variety of audiences including the National Science Foundation which funded a large part of the implementation and demonstration; the developers who designed and executed the implementation and demonstration; the participants in the implementation, demonstration, and evaluation; the educational community interested in the potential of computer-based education; and the educational research community. It is expected that some information will be more relevant to specific groups. Simple descriptive information may satisfy the needs of some; others will require information based on well-designed studies and statistical tests. This evaluation report provides both types of information.

The first objective of the evaluation, implied by the general purpose stated above, was to describe the implementation and demonstration as it was actually carried out. Although the developers and participants are familiar with the PLATO system, a description of the program is included in Chapter 2 for those less familiar with the implementation and demonstration. This description provides information adequate for answering many of the questions about the degree to which the goals and objectives of the developers were attained in the implementation and demonstration.

The second objective of the evaluation was to provide information about the educational effectiveness of the PLATO system. The evaluators have attempted to collect information in as many outcome areas as could reasonably be determined in discussions with the developers, the participants, the National Science Foundation, and the consultants to the project. In general, the following questions were used by the evaluators in designing the various components of the evaluation study:

1. To what extent was the originally projected PLATO computer-based education system actually implemented and demonstrated?
2. How was student attrition affected by the implementation and demonstration?
3. How was student achievement affected by the implementation and demonstration?
4. How were student and/or teacher attitudes affected by the implementation and demonstration?
5. How was the behavior of students and/or teachers affected by the implementation and demonstration?

6. How effective was the curriculum development effort during the implementation and demonstration?
7. What side effects of the implementation and demonstration have occurred?

These questions correspond to chapters in the report.

1.5 Matters outside the scope of this evaluation

There were a number of limitations to this evaluation. There has been no attempt to compare PLATO with other computer-assisted instruction systems. Experimental units referred to in the report are those classes in which the PLATO system was used. There was no attempt at planned variation within the treatment condition. Instructors had complete freedom in deciding how and to what extent to utilize the system. A great deal of variation occurred as a result of this approach to the implementation. Control or comparison units referred to in the report are corresponding classes in which the PLATO system was not used. Therefore, hypotheses tested in the comparative studies are formulated in terms of broadly defined treatment and control conditions.

The evaluation did not deal with detailed analyses of the effects of specific lessons. Although some lessons remained intact during the course of the implementation and demonstration, many lessons were revised and many new lessons were created. There was no prior projection that specific lessons would be used by instructors of students. It will be shown in Chapter 2 that there was considerable variation in lessons used both across classes within a subject area and across students within a class. Given the objective of the developers that the instruction be flexible and individualized, this variation could be considered a positive outcome.

Although instructors were expected to develop instructional materials, the detailed evaluation of instructional materials was not an objective of the evaluation. In general, the curricula for the various courses already existed. Instructional materials on PLATO were intended to be consistent with the curriculum in specific courses and integrated into the instructor's instructional delivery system along with other instructional materials. No instructor was constrained to present material to students in any particular instructional mode. The data in Chapter 2 show that attempts at evaluation in this area of curriculum evaluation would have been premature.

Finally, this evaluation study is limited to the educational effectiveness of the PLATO system. It does not deal with the cost and technical aspects of the PLATO implementation and demonstration.

1.6 Summary

The PLATO computer-based education system was implemented and demonstrated within the context of an on-going educational system. As a result, the circumstances surrounding this project were very much those that would be found in any attempt to inaugurate an innovative educational program in a real world setting. Individual colleges and instructors played a major role in determining the manner and extent of the implementation and demonstration.

The evaluation was tailored to fit the implementation and demonstration. Few constraints were imposed by the evaluators. Cooperation in setting up comparison classes and collecting data was requested and voluntarily given. As a result, the evaluation plan was dependent on the interest and cooperation of all participants in the project, both developers and community college staff. The project was not tailored to fit a preconceived evaluation mold. In large part, the success of the evaluation was achieved because of this flexible approach.

Chapter 2

Specification of The Program

The purpose of this chapter is to describe the PLATO Computer-based Education System as it was implemented and demonstrated at the community college level during the four and a half year period of the project. For purposes of clarity, it is convenient to draw a logical distinction between the implementation and demonstration phases. Originally, the developers intended to begin the first demonstration year in September, 1973. The period from January 1, 1972 to September 1, 1973 (20 months) was to be devoted to identifying the participating colleges, soliciting their participation, training a core of instructors, developing or assisting the instructors in developing an appropriate core of lessons, installing and testing the student terminals, and generally getting ready for the two demonstration years. In June, 1973, the intended numbers of student terminals had not been installed nor had an appropriate core of lessons been developed. The implementation phase was extended by one year and additional staff was employed to develop additional lessons and provide the necessary liaison with instructors in developing plans for the integration of PLATO lessons into appropriate community college courses. The first demonstration year was postponed until September, 1974. Thus, for purposes of reporting, the period from January 1, 1972 to August 31, 1974 is considered the implementation phase of the project; and the period from September 1, 1974 to June 30, 1976 is considered the demonstration phase.

2.1 Implementation of the program

The first task in the implementation period was to select the participating colleges. This selection was based on the following four criteria:

1. sufficient proximity to the Computer-based Education Research Laboratory (Urbana, Illinois) to be economically feasible;
2. sufficient size to provide enough students for meaningful evaluation;

3. sufficient institutional commitment to assure effective relations for carrying out curriculum development and testing, the instructional program, and the evaluation program; and
4. sufficient diversity of student body and organizational setting to provide representativeness.

One community college, located within a few miles of the Computer-based Education Research Laboratory, had already used the PLATO III System. It agreed to participate in the implementation and demonstration of the PLATO IV System. The student body of this downstate community college was primarily white and middle class drawn from surrounding small towns and a few medium-sized cities.

The City Colleges of Chicago had expressed interest in participating in the implementation and demonstration project. A few instructors in the Chicago colleges were already familiar with the PLATO system. In addition, the City Colleges of Chicago (CCC) were far enough removed from the Computer-based Education Research Laboratory (CERL) to provide adequate testing of the communications network necessary for delivery of services at a distance of about 150 miles. At the same time, the location of sites in close proximity to one another provided the opportunity for cooperation between sites and facilitated the extensive liaison effort that had been projected by CERL.

Three colleges were selected, one in the south of the city, one in the northwest suburbs, and one just west of the downtown area. In two of the colleges, more than 90% of the students were black; in the third college, the majority of students were white. Students varied in these three colleges from those who were weak in basic skills to those who were well prepared and likely to complete their community college education and transfer to four year colleges and universities for further education.

A fourth institution in the City Colleges of Chicago system was also selected for participation in the implementation and demonstration project. This institution was basically a training center for adults. It was unique in the sense that it did not offer a standard community college program of instruction nor did students follow a semester schedule. Students entered and left programs on monthly schedules. It was not possible to include this institution in the simple basic evaluation design for testing achievement. Nevertheless, the PLATO IV System was implemented and demonstrated in this institution, and the evaluators have collected information about the implementation and demonstration and have included this institution in the evaluation to the extent possible given its unique status.

The second task during the implementation period was to install the student terminals and the communication network necessary for the demonstration phase. The installation of terminals proceeded more slowly than had originally been anticipated, but the necessary equipment was in place and ready for student use by the summer of 1974. Although there were minor problems associated with the physical conditions in the project, the evaluators considered the conditions at each site very adequate for the demonstration. In describing these conditions, and in the remainder of the report, the five participating institutions will be referred to as Colleges I, II, III, IV, and V to provide reasonable anonymity to the participants.

The colleges provided space for the student terminals and support staff at the site to take care of scheduling, provide minor maintenance capabilities, and assist instructors and students in using the system. In two colleges, the downstate college and the adult training center, separate rooms were provided for the exclusive use of the PLATO terminals. These rooms were large and allowed easy observation of students by circulating instructors and site staff. The downstate college was allocated 28 student terminals and the adult training center 16. In two additional colleges, 24 student terminals were set up in the Learning Resources Centers. Although there was some distraction due to other activities going on in the centers, these arrangements proved to be very adequate and allowed easy observation of students by circulating instructors and site staff. In the fifth college, 24 terminals were installed in a section of the library. This facility was cramped. It was not as easy to circulate and observe students as it was in the other colleges. In addition, access to the library and the PLATO terminals was severely restricted at night and on weekends. In spite of these restrictions, the conditions for the demonstration were adequate.

In addition to selecting the colleges and installing the PLATO student terminals, several other tasks were accomplished during the implementation period. Six staff members of the community colleges were trained in the use of the TUTOR language at CERL. University of Illinois extension courses were offered for community college instructors in the Summer 1972, Fall 1973, Spring 1973, and Spring 1974 semesters. The primary purpose of these courses was to acquaint potential PLATO users with the PLATO system. Some of the participants in these courses received released time to develop lessons for the PLATO system. CERL course coordinators were added to the CERL staff during the implementation period to organize and/or develop lessons for use in the demonstration phase of the project. The development of the courseware in the project is treated more fully as a program outcome in Chapter 8 of the report.

2.2 Demonstration of the program

The developers agreed to demonstrate the PLATO system by delivering instruction to students in five subject areas: accountancy, biology, chemistry, English, and mathematics. The general aim during the demonstration period (September, 1974-June, 1976) was to deliver this instruction to approximately 300 students in each subject area in the first year and to approximately 400 students in each subject area in the second year. Each subject area was to be represented in at least three of the five participating colleges. The developers succeeded in reaching and exceeding these general goals, but the usage of the system was very varied across the colleges, the subject areas, courses within each subject area, classes within courses, and even across students within each class.

Therefore, to accurately describe the program, and especially to depict the magnitude of the variation, it is necessary to describe the demonstration in considerable detail.

At the most general level, the numbers of students who were exposed to PLATO in each subject area in each college gives a broad overview of the demonstration. In Table 2.2.1, these numbers are given for each of the four semesters of the two year demonstration period.

Table 2.2.1

Students Using the PLATO System
Fall 1974

	College I	College II	College III	College IV	College V	Total
Accountancy	-	82	531	136	-	749
Biology	357	102	81	-	-	540
Chemistry	142	201	264	115	-	722
English	160	298	285	395	110	1,248
Mathematics	319	-	-	352	113	784
Total	978	683	1,161	998	223	4,043

Spring 1975

	College I	College II	College III	College IV	College V	Total
Accountancy	35	24	309	87	33	448*
Biology	359	262	375	-	-	966*
Chemistry	151	142	221	-	-	586*
English	395	385	249	120	211	1,353*
Mathematics	348	**	81	179	194	908*
Total	1,288	813	1,235	386	438	4,261*

Note: The * indicates that the totals were provided directly by CERL. Numbers within the table were compiled from a variety of sources and are approximate. For that reason, the totals do not agree exactly. The ** indicates usage not identified in terms of individual students.

Table 2.2.1 (cont.)

Students Using The PLATO System
Fall 1975

	College I	College II	College III	College IV	College V	Total
Accountancy	35	32	349	181	10	607
Biology	414	204	446	-	-	1064
Chemistry	149	244	198	63	-	654
English	568	296	141	264	158	1427
Mathematics	296	-	23	136	66	521
Total	1462	776	1157	644	234	4273

Note: Figures in this table have been aggregated from the CERL Community College Users' Report: Fall 1975.

Spring 1976

	College I	College II	College III	College IV	College V	Total
Accountancy	77	20	268	97	32	494
Biology	436	303	441	-	-	1180
Chemistry	171	460	184	161	-	976
English	425	345	179	220	311	1480
Mathematics	130	217	161	204	219	931
Total	1239	1345	1233	682	562	5061

The data in Table 2.2.1 show that the originally projected numbers of participating students were greatly exceeded. However, the fact that large numbers of students were exposed to the PLATO system is not proof in itself that the system was used in an appropriate sense for student instruction. A simple exposure of many students to a brief demonstration of the PLATO system could have resulted in these large numbers. The developers obviously did not intend the system to be used in this trivial sense. Instructors were expected to integrate the use of PLATO instruction into their courses for about one-third of their instructional time. Therefore, to provide a more informative picture of the PLATO demonstration, it is necessary to examine the usage data at the course and class level.

To illustrate the extent and variation of PLATO usage across courses and classes, data on biology courses for the first three semesters of the demonstration period are given in Table 2.2.2. The title of the course is given with the corresponding numbers of participating students and the average time spent by students using PLATO in each course/class.

Table 2.2.2

Biology Usage by Classes
Fall 1974

College	Course	Total Number of Students	Average Number of Hours Per Student Per Semester
I	Bio 101	37	4.08
	Bio 102	32	2.06
	Bio 111	32	4.10
	Bio 111	40	4.33
	Bio 111	32	4.37
	Bio 111	28	5.58
	Bio 112	32	7.21
	Bio 112*	66	6.69
	Botany 201	32	8.02
II	Bio 101*	82	4.83
	Bio 102	21	3.36
III	Bio 102*	51	2.54
	Bio 111	28	2.19

*Combined data on two sections

Table 2.2.2 (cont.)

Biology Usage by Classes
Spring 1975

College	Course	Total Number of Students	Average Number of Hours Per Student Per Semester
I	Bio 101	23	6.42
	Bio 101	24	3.38
	Bio 111	36	6.17
	Bio 111	25	2.81
	Bio 111	33	4.28
	Bio 111	29	4.88
	Bio 111	36	4.11
	Bio 112	34	6.90
	Bio 112	42	10.81
	Bio 112	37	7.74
	Bio 112	15	6.91
	Bio 119	25	2.00
II	Bio 101	17	3.60
	Bio 101	9	4.69
	Bio 101	22	4.63
	Bio 101	12	2.05
	Bio 102	29	5.13
	Bio 102	26	4.38
	Bio 111	21	7.77
	Bio 111	26	2.71
	Bio 126	19	0.63
	Bio 126	38	6.29
	Bio 127	43	6.51
III	Bio 101	32	10.97
	Bio 102	30	7.91
	Bio 102	32	7.72
	Bio 102	31	8.87
	Bio 102	29	13.14
	Bio 102	29	2.20
	Bio 102	38	2.61
	Bio 111	31	6.64
	Bio 112	22	4.32
	Bio 112	36	6.84
	Bio 112	18	10.39
	Bio 112	23	9.61
	Bio 112	24	5.97

Table 2.2.2 (cont.)

Biology Usage by Class
Fall 1975

College	Course	Total Number of Students	Average Number of Hours Per Student Per Semester
I	Bio 101	29	1.7
	Bio 102	23	2.9
	Bio 111	30	5.1
	Bio 111	34	5.7
	Bio 111	35	6.4
	Bio 111	37	5.6
	Bio 111	33	5.6
	Bio 111	35	3.6
	Bio 111	37	9.5
	Bio 112	26	4.5
	Bio 112	36	5.8
	Bio 112	29	6.2
	Botany	30	6.0
II	Bio 101	32	4.4
	Bio 101	24	4.9
	Bio 111	35	4.5
	Bio 111	26	1.0
	Bio 126	22	2.3
	Bio 126	38	2.7
	Bio 127	27	1.5
III	Bio 101	39	3.3
	Bio 101	37	3.6
	Bio 101	29	3.8
	Bio 101	25	4.1
	Bio 101	27	8.5
	Bio 101	36	5.5
	Bio 102	38	3.4
	Bio 102	27	6.1
	Bio 102	28	8.1
	Bio 102	33	8.3
	Bio 111	23	8.1
	Bio 111	33	7.3
	Bio 112	26	10.6
	Bio 112	26	7.7
	Bio 126	31	0.6
	Bio 127	21	2.7

The data in Table 2.2.2 show that biology lessons were used in three colleges primarily in Biology 101, 102 (a general biology course without laboratory) and Biology 111, 112 (a general biology course with laboratory). The usage of the PLATO system varied substantially across courses and classes. The average time per student of PLATO usage may be misleading in that students who began the course, used PLATO only for a brief period, and dropped out of the course were generally included in these summary data. Nevertheless, these data depict clearly the substantial variation in the extent of usage that occurred during the demonstration period. To provide a fairer assessment of the extent of usage, the average times per student for students who completed their courses are given in Table 2.2.3 for 16 biology classes which participated in the achievement study in the Fall 1975 semester. Corresponding data are reproduced from Table 2.2.2 for comparison purposes.

Table 2.2.3

Comparison of PLATO Usage for All Students and for Students Who Completed The Course
Fall 1975

College	Course	Total Number of Students	Average Number of Hours	Students Who Completed Course	Average Number of Hours
I	Bio 111	30	5.1	13	6.3
	Bio 111	34	5.7	24	6.7
	Bio 111	35	6.4	21	7.4
	Bio 111	37	5.6	20	7.1
	Bio 111	33	5.6	20	6.8
	Bio 111	35	3.6	13	5.0
	Bio 111	37	9.5	29	10.7
	Bio 112	26	4.5	15	5.1
	Bio 112	36	5.8	27	6.8
	Bio 112	29	6.2	14	7.8
II	Bio 101	32	4.4	14	6.3
	Bio 101	24	4.9	13	7.5
III	Bio 102	38	3.4	10	6.9
	Bio 102	27	6.1	15	6.3
	Bio 102	28	8.1	22	9.0
	Bio 102	33	8.3	13	8.7

The data in Table 2.2.3 show that the average time spent by students who completed their courses was about 20% higher than the general average time of all students in the class who used the system. However, average time of student usage masks the very wide variation that occurred even within classes which used the PLATO system. The evaluators consider this wide variation important for an accurate understanding of the program and for the subsequent definition of the "treatment" in the comparative analyses performed in the following chapters of this report.

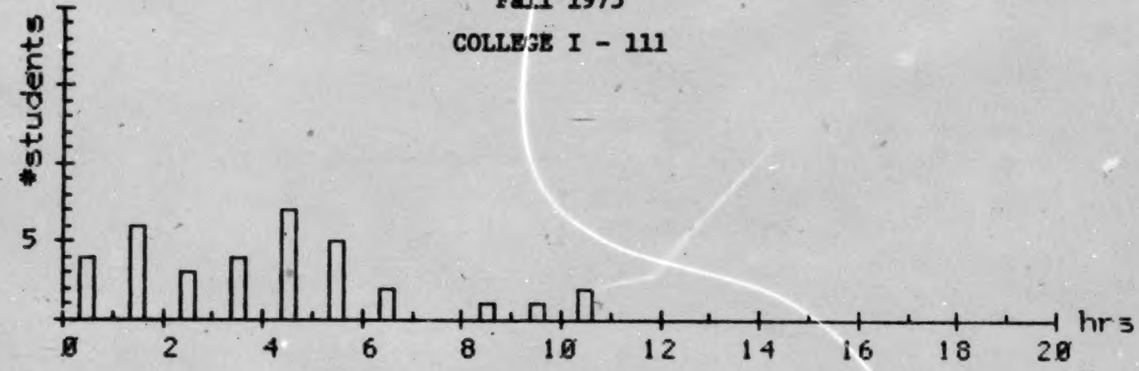
In order to illustrate the variation in student usage within classes, histograms showing the distribution of student times in three biology classes are given in Figure 2.2.1. These histograms, and those in the appendix, were provided by CERL in its various reports to the National Science Foundation and shared with the evaluators. These distributions are representative of the types of distributions that occurred in most classes. The histograms in Figure 2.2.1 illustrate that the program being evaluated, and the subsequent definition of the "treatment," cannot be simply defined in terms of a specified amount of exposure to PLATO instruction at the class level. This statement is not intended as a criticism of the PLATO program. In fact, a goal of the PLATO system was to provide individualized instruction. Differences in student usage were expected. Instructors were free to use the system as much as, or as little as, they desired. There was no predetermined PLATO curriculum required to be used in any class. Therefore, not only was extent of usage expected to be varied, but the actual materials used by students across common courses, and even within a single class, were also expected to vary.

To illustrate that instructors did indeed differ in using PLATO materials, even in what might be considered similar courses, data are presented in Table 2.2.4 showing the numbers of students who used specified lessons in 19 biology classes in an introductory biology course (Biology 101/111).

Figure 2.2.1

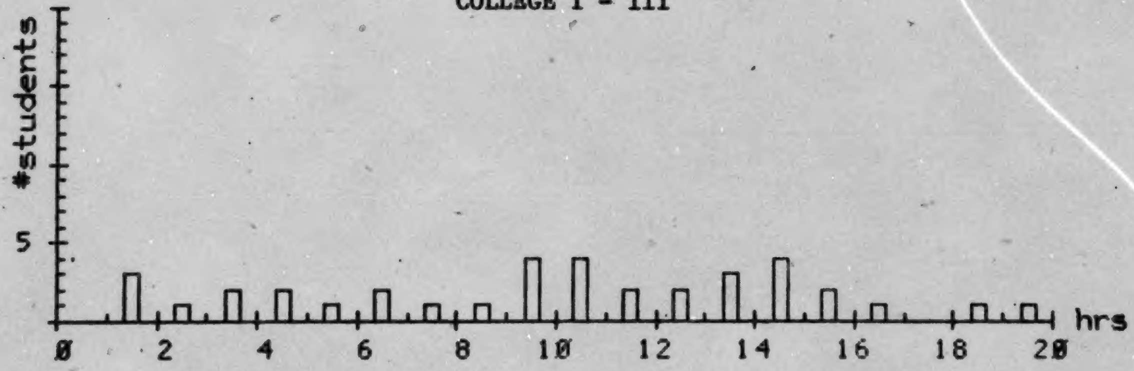
Student Usage in Three Biology 101/111 Classes
Fall 1975

COLLEGE I - 111



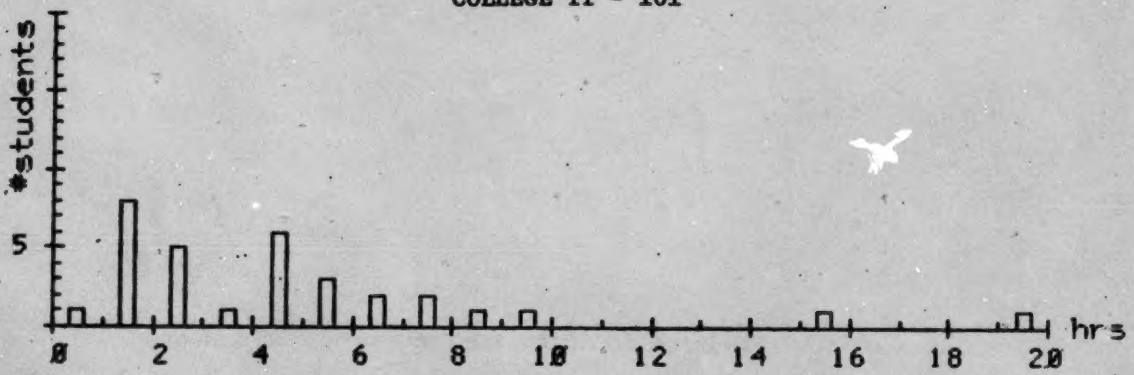
35 students, 126 hours. Average: 3.6

COLLEGE I - 111



37 students, 352 hours. Average: 9.5

COLLEGE II - 101



32 students, 141 hours. Average: 4.4

Table 2.2.4

Student Use of Lessons in Nineteen Biology 101/111 Classes
Fall 1975

	College I							College II				College III							
Lessons	111	111	111	111	111	111	111	101	101	111	111	101	101	101	101	101	101	111	111
1A	16	8	23	26	23	11	14				3			24	31	36	34	19	32
1B	1	4	26	27	3	3	23							15	11				
1G	2	3			17														
1H		1																	
1I						18													
2A	2	29	32	32	21	26	26	19	15	23		1						22	
2C	24	29	34	33	21	33	29	19	18	26	2	1		25	28	37	35	23	32
3A		22				15		3				1							1
3C		30	23	24	20	29	20	11	13		6	12	7	20	26	30	28	23	29
3D		12			1	14													
3E		9				8													
3F						2	19					23	16					20	
3G							9												
4A											5	11	8						
4B											4	22	18						
4E										1	4								
5A	33				15			12	13		1	28	21	7	4				15
5B					8									5	2	1			12
6A	1			1										18	15	25	33	23	24
6B	7	20	1	1	12			12	11		1			18	19	4	2	14	29
6E	27		22	16		1		9	8		1	19	13	22	21			18	26
6F	25		9	9				9	8		3	13	5	20	17	1		19	24
6G	11		4	3				7	4			6	2	11	10	1		16	20
6H	3				3	4								1		1			1
6I	5					1								14	18	1			22
7A										1									
7D																1			
7E																1			
7F		1	2				6							5	4	1			12
9B				1	2														
10A				1															
10B														13	8				5
10G																		6	
12A																		13	
13A														14	7			5	7
13B														10	4			6	1
13C										1									
13D	22				2	9	3	1	5	29	5							16	
13E	14					13				1		19	13	15	15			15	12
13F						1				25	1			12	18			9	14
13H														8	2				1
14A														4	2		1	5	2
14B																	1	8	
14C																	1	1	

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*Each entry gives the number of students in that class who used the lesson identified at the left.

The data in Table 2.2.4 show that classes used different PLATO lessons. Therefore, even within a single course, the program, and the subsequent definition of the "treatment," cannot be considered as exposure to a specified set of curriculum materials.

Finally, even within a single class, students differed both in amount of exposure and curriculum materials studied. To illustrate this variation at the class level, data are given in Table 2.2.5 showing the amount of time spent by each student in each lesson for one class in biology. The data in Table 2.2.5 show that in a very real sense each student received a unique "treatment." Of course, the students in any class can be considered as receiving a unique "treatment" in terms of their personalities, attention spans, and interests. But, in most program evaluations, the program to which students are exposed is generally more well defined and more easily distinguished from comparison programs than is the case in this study.

Although the illustrations given have been taken from the area of biology, the situation was very similar in the other four areas. Tables and figures for the areas of accountancy, chemistry, English, and mathematics are given in the appendix (Tables 2.2.2a-2.2.5g).

Virtually all of the data presented in describing the PLATO demonstration were collected on-line by the developers and provided to the evaluators. However, a member of the evaluation staff worked full time at the Computer-based Educational Research Laboratory during the demonstration period and monitored the data collection activities. This staff member worked cooperatively with the CERL staff in programming some of the early software programs for collecting and summarizing student data. Although some student on-line data were collected independently by the evaluators in the early stages of the demonstration period, the need for considerable and coordinated management of data collection activities rendered the independent collection of on-line data by the evaluators unfeasible.

Table 2.2.5

Minutes in Each Lesson by Students in One Class
College II: Biology 101

	Lesson									
Student	2A	2C	3A	3C	5A	6B	6E	6F	6G	13D
1	69	23				8	12			
2	2									
3	24	69		6	49	7		9	8	
4	58	24								
5	47	23	9		5					
6					13					
7	69	22	100	18		2		7		
8	89	99		77	141	14	18	36		
9	11									
10		32	26			8				
11	48	32			63	10	7	45		
12	19	45			67	13				
13	19	22		52	43	10	17	21	13	
14	52	47		34		10	23	24	17	
15	13			33						
16		11								
17	76	92		113	152	38	45	81	2	
18	3	56			55	11	1			19
19	38	32		19	2	8		19	15	
20	20	19					18			
21	1	32		39			14	33		
22	132	41		39						
23		50								
24					22					
25					46					

2.3 Summary

To summarize the description of the program, in each of the four semesters of the two demonstration years, approximately 4,000 students in more than 100 different classes in several dozen different courses in the five targeted subject areas in the five participating colleges used a wide variety of PLATO lessons for differing amounts of time ranging from less than a few minutes to more than 20 hours. Although much of this variation occurred at the college, course, and class levels, there were substantial differences between students in the same class in both extent of usage and the particular instructional materials viewed on the PLATO terminals. The tables and figures presented are intended to portray to the reader at least the skeleton of the program. Instructors were not given a prescribed set of lessons for exposure to their students. Students, on their part, did not march in unison to a set of terminals, sit down, and view the same material. The wide variation in usage both across and within classes was expected by the developers and was a practical consequence of their basic philosophy that instruction should be managed by the instructor and should be individualized at the student level.

This description has very strong implications for the evaluation. Each student received a unique treatment in terms of dosage and content. PLATO was used for the most part during class time. However, students were able to use the system outside of class time. Some students did; others did not. PLATO lessons were sometimes used to replace ordinary classroom instruction. Often they were used to supplement and reinforce classroom instruction. Some students were absent on "PLATO" days. They may have learned the material covered on PLATO by studying other materials. Some students worked at a PLATO terminal with a companion and did not receive "credit" in terms of amount of dosage received. If two students work cooperatively at a terminal, only the student who is actually "signed-on" gets "credit" for the usage. Because of these diverse factors, no precise definition of the treatment was established as a basis for the evaluation. PLATO classes were simply classes in which the instructors used the PLATO system in whatever ways they deemed most appropriate.

Chapter 3

Design of The Evaluation

The two objectives of the evaluation were to describe the implementation and demonstration of the PLATO system and to provide information about the educational effectiveness of the system. Plans were formulated to achieve these objectives.

The information contained in this report ranges from descriptive information to information derived from comparative studies. The PLATO computer-based education system has been viewed as having many components. Some components (for example, the development of lesson material) do not lend themselves to comparative studies and hypothesis testing. Observation and questionnaire data will be the basis for information provided in these areas.

In general, the following questions guided the design development, data collection, and analysis strategies:

1. What is the impact of the computer-based education system on student attrition, achievement, attitudes, and behaviors?
2. What is the impact of the PLATO system on community college faculty attitudes and behaviors?
3. What is the impact of the PLATO system on participating institutions?

3.1 Basic experimental design

The basic experimental design, carefully implemented in the second demonstration year of the project, was predicated on the expectation that sizable numbers of classes in the introductory courses in the five subject areas in one or more of the participating colleges would use the PLATO system. The first demonstration year provided the opportunity to test the feasibility of the design and to field test the data collection instruments. It was not feasible to include College V in the overall basic design for a comparative study of achievement. In College V, students entered and left the school at odd intervals. As a result, intact classes did not exist over time. In the other four colleges, it was possible to arrange for comparable experimental and control classes in most subject areas.

As instructors became more familiar with the purpose of the evaluation, some instructors agreed to provide their own comparison classes by not using PLATO in one or more of their classes. Department chairpersons, college administrators, and the CERL staff assisted ETS in implementing this phase of the design. This cooperative effort resulted in 30 instructors acting as their own controls in the Fall 1975 semester and 19 in the Spring 1976 semester. When this was not possible, other instructors were asked to participate in the evaluation and allow their classes to serve as comparison groups. It was not possible in all cases to obtain comparison classes. In some cases, there simply were no additional classes in the same course to serve as comparison classes. In a few cases, arrangements were made for comparison classes and late scheduling changes resulted in more comparison classes than experimental classes. It was considered useful to retain the extra comparison classes in these cases to allow for analyses with both identical and different instructors. Also, it was anticipated that some classes might not follow through with all the required testing and collection of attitude information. Participation was voluntary and the incentives were minimal. However, all PLATO instructors carried out the required data collection activities; two comparison instructors did not administer the necessary posttests.

It was not possible in implementing the basic design to assign students randomly to instructors and classes. College students selected their courses at particular time-slots. The registration procedure consisted of students lining up, requesting a particular course at a particular time, and being assigned alternately to the classes available at that particular time-slot. At the time of registration, students did not know which classes would actually use the PLATO system. For that reason, student self-selection into PLATO and non-PLATO classes was virtually impossible. Even if students knew that teachers were likely to utilize PLATO, the fact that many instructors had agreed not to use

PLATO in one or more of their sections of a particular course further precluded any bias in the study due to student self-selection into the PLATO program.

Classes were not assigned at random to the PLATO and control conditions when the instructor was identical across treatment and control. By and large, instructors who were serving as their own controls decided in cooperation with the site coordinators which of their classes would use the PLATO system based on the constraints imposed by scheduling classes into the PLATO laboratory. Where flexibility was possible, the evaluators suggested the selection to balance times of instruction across experimental and comparison classes. In one case, the determination was made by the flip of a coin. Although the assignment of classes to the experimental and control conditions was not random, a wide variation in times of instruction in both the experimental and control conditions resulted. In addition, the assignment resulted in approximately half of the instructors who served as their own controls using PLATO with their earlier class and half using PLATO with their later class. In general, the processes used to implement the design resulted in a relatively well-balanced quasi-experimental design with no obvious sources of bias.

To summarize, the aim of the basic design was to obtain in each targeted subject area a yoked design with some instructors teaching both PLATO and non-PLATO classes, some instructors teaching only PLATO classes, and some instructors teaching only non-PLATO classes. In Tables 3.1.1 and 3.1.2, the designs are shown as they were implemented in the second demonstration year. The letters A through V are used to distinguish separate courses and colleges. Numbers 1 through 9 are used to distinguish instructors within courses within colleges. Thus, for example, in English 100 at College I, three instructors taught both PLATO and non-PLATO sections, one instructor taught a PLATO section only, and one instructor taught a non-PLATO section only.

3.2 Data collection instruments and activities

Data collection instruments consisted of achievement tests, attitude questionnaires, and observation protocols. Although instructors and CERL staff participated in the development of all data collection instruments, their participation was greatest in the achievement area. Instruments are described in the following sections under the three categories of achievement, attitude, and observation instruments.

Achievement tests. The achievement tests used in the PLATO evaluation were designed by ETS in cooperation with the instructors in the community colleges. The general paradigm used in each subject area included an initial study of the curriculum outlines for each college in each targeted course. The course outlines served as guides for the ETS test development specialists in selecting items in accountancy, biology, chemistry, English, and mathematics from a large variety of ETS tests for review by the instructors in the colleges. In accountancy, biology, English, and mathematics, instructors agreed to assist in designing pretests and posttests for their courses. There was reasonable agreement that a pretest designed to assess students' abilities in the various course areas and posttests designed to measure final achievement in specific courses would provide the means for the most valid assessment of student development in a particular course. The posttests were to be used as final examinations in the appropriate courses. In chemistry, instructors preferred topical tests to be administered at appropriate points during the course in lieu of an overall final examination. In one college, instructors desired both typical tests and an overall posttest in chemistry.

The first efforts at test development began in 1973 with a small group of volunteer instructors in the appropriate subject areas. Pretests were developed using materials primarily from the Comparative Guidance and Placement Program. Specifications called for a pretest of approximately 45 minutes in length to be administered at the beginning of each semester or quarter. They were designed to measure the knowledge and skill of beginning students in each of the courses.

Table 3.1.1

Evaluation Design
Fall 1975

Course	College I		College II		College III		College IV	
	P	NP	P	NP	P	NP	P	NP
Business 101	A1	A2	B1	B1	C1	C1		
					C2	C3		
					C2	C4		
					C2			
Biology 101, 111	D1	D1	F1	F1				
	D2	D7	F1	F1				
	D3	D8						
	D3	D9						
	D4							
	D5							
	D6							
Biology 102, 112	E1	E4			G1	G1		
	E2	E4			G1	G1		
	E3				G2	G2		
					G3	G3		
Chemistry 101, 121	P1	P1	Q1	Q1	U1	U1	V1	V1
			Q2	Q2	U2		V2	V2
			Q3				V3	V3
Chemistry 201			R1	R1				
			R2					
			R3					
English 100	H1	H1			L1	L1		
	H2	H2			L1	L2		
	H3	H3			L3	L3		
	H4	H5				L2		
English 101	I1	I1	K1	K1	M1	M1	N1	N1
	I2	I2	K2	K2	M2	M2	N1	
	I3	I3	K3	K3		M2		
		I4	K4	K1		M3		
		I4	K4	K5				
		I5						
Math 111	O1	O1						
	O2	O3						

Table 3.1.2

Evaluation Design
Spring 1976

Course	College I		College II		College III	
	P	NP	P	NP	P	NP
Business 101	A1	A2			C1	C1
					C5	C5
Biology 101, 111	D5	D7				
	D6	D9				
	D8					
Biology 102, 112	E6	E4	F1	F1	G1	G1
	E7	E4		F1	G1	
Chemistry 121			Q2	Q2	U1	
			Q1			
			Q4			
			Q5			
English 100	H1	H1			L3	L3
	H2	H2				
	H3	H3				
	H4	H5				
English 101	I1	I1	K2	K2	M1	M1
	I2	I2	K2	K2		
	I3	I3	K6	K6		
	I6	I6				
	I2					
	I6					
Math 111	O1	O1				
	O4	O4				

This process resulted in six pretests, one in each of the areas of accountancy, chemistry, English, and mathematics, and two in the area of biology for what were considered distinct levels of biology courses in the colleges. Instructors agreed to use the pretests across colleges.

The posttests were more difficult to construct. In English, an essay examination was developed to accompany an objective test of English language skills at both the pretest and posttest levels. The English instructors were able to agree on a common posttest across the colleges which allowed for considerable pooling of data in the analysis stage of the evaluation. In the other subject areas, it was not possible to reach agreement on posttests that were valid across colleges. Curriculum outlines and specific emphases varied even in subjects with similar titles. ETS therefore worked closely with individual colleges in order to tailor the posttests to their courses. This approach was based on the rationale that, although increased sample size attained by pooling across colleges was desirable, the validity of the tests for the courses involved was absolutely essential to the evaluation. This resulted in the development of three posttests in accountancy, four posttests in biology, more than 25 chemistry topical tests, one chemistry posttest, and three mathematics posttests. Within a college, it was possible to reach agreement on a single posttest across the different sections of the same course. In one college, three different forms of the same topical tests were constructed to maximize teacher cooperation. These are not counted in the number of topical tests.

The achievement tests were field tested in the first demonstration year with both PLATO and non-PLATO instructors using the tests. Initial test reliabilities (internal consistency estimates) for the first demonstration year are given in Table 3.2.1. Instructor comments on the tests and the item statistics for the first year were used to revise the tests for the 1975-76 demonstration year. The most common

Table 3.2.1

Reliabilities of Achievement Tests

Test ID	Name	1974 - 75 # of Items	1974 - 75 r	1975-76 # of Items	1975-76 r
I.	Pretests				
131	Accounting Pretest	40	.80	40	.80
231	Biology Pretest I	50	.82	45	.80
232	Biology Pretest II	50	.68	45	.63
331	Chemistry Pretest	55	.87	55	.89
431	Mathematics Pretest	70	.91	70	.89
531	English Pretest	50	.91	40	.89
II.	Posttests				
191	Accounting Posttest I	100	.90	54	.88
192	Accounting Posttest II	90	.93	50	.90
193	Accounting Posttest III	100	.90	50	.86
291	Biology Posttest I	50	.70	50	.86
292	Biology Posttest II	100	.85	50	.81
293	Biology Posttest III	50	.70	45	.68
294	Biology Posttest IV	50	.68	50	.84
391	Chemistry Posttest	60	.87	60	.85
491	Mathematics Posttest	35	.79	37	.80
591	English Posttest	50	.91	40	.88
III.	Chemistry Topical Tests				
	1. College I: Chemistry 121				
371	Atomic Structure and Bonding	30	.77	22	.62
374	Nomenclature	30	.86	25	.80
377	Formulas, Equations, Stoichiometry	25	.89	20	.53
383	Gases	25	.79	20	.54
	2. College II: Chemistry 121				
362	Atomic Structure and Bonding	30	.77	22	.76
363	Nomenclature	30	.86	25	.85
365	Formulas, Equations, Stoichiometry	25	.89	20	.78
369	Molecular Weights	--	--	20	.75
360	Solutions	--	--	25	.88
	3. College II: Chemistry 201				
361	Atomic Structure and Bonding	30	.81	25	.82
364	Formulas, Equations, Stoichiometry	25	.85	20	.75
366	Gases	25	.76	20	.66
368	Solutions	30	.81	23	.65
	4. College III: Chemistry 121				
341	Atomic Structure and Bonding	30	.77	30	.80
342	Nomenclature	30	.86	30	.85
343	Formulas, Equations, Stoichiometry	25	.89	25	.89
345	Gases	25	.79	25	.74
346	Solutions	--	--	26	.53
	5. College IV: Chemistry 101				
351	Stoichiometry & Nuclear Structure	30	.78	25	.76
352	Bonding and Nomenclature	30	.77	30	.78
354	Gases	25	.79	25	.74

remark of teachers was that some tests were too long. Test reliabilities for the revised tests used in the Fall 1975 semester are also given in Table 3.2.1. In mathematics, several tests were not suitable for continued usage due to a shift in the courses in which PLATO was used. During the summer of 1975, an attempt to develop additional tests in mathematics for the 1975-76 year and to obtain the participation of more mathematics instructors proved unsuccessful. As a result, the evaluation of achievement results in mathematics was limited to one mathematics course at College I.

By the Fall 1975 semester, acceptable tests of achievement had been developed and revised. The tests were designed with the curriculum objectives of each course in mind to provide a fair assessment of both PLATO and non-PLATO courses. No attempt was made to match test items with specific PLATO instruction. Given the variations in content of PLATO instruction both across and within classes that occurred in the implementation, the achievement testing plan served its purpose very well.

Student questionnaires. In addition to assessing the effects of the PLATO system on student achievement, it was considered desirable in the evaluation to assess the impact of the PLATO system on student attitudes, opinions, and behaviors. In developing the achievement tests for the evaluation, the problem of content validity was relatively straightforward. It was clear that the objectives of a chemistry course included the learning of some specific content in chemistry by the student. Objectives in the attitude area were much more difficult to specify. Four of the community colleges routinely administered questionnaires to students for the evaluation of instruction. The questionnaires were markedly different in terms of complexity (number and type of items and responses) and content (information about instructors, personal information about attendance, grading, etc.). These questionnaires did not include questions about computer-assisted instruction. ETS used these questionnaires and others from the

Comparative Guidance and Placement Program and the Teacher Behavior Research Program to fashion a set of preliminary items about attitudes toward instruction. In addition, existing questionnaires used in previous studies of computer-assisted instruction were reviewed for appropriate items. A preliminary questionnaire was designed and field tested in Spring 1973 with a class of 30 students in one college. In addition to giving their responses, students were asked to comment on the items. Members of the CERL staff and several community college instructors were asked to review this preliminary questionnaire. On the basis of comments received, two revised preliminary questionnaires were designed for PLATO and non-PLATO students for field testing in the first demonstration year. The preliminary questionnaires were rather widely criticized in the first semester of administration. Instructors and CERL staff felt that the questionnaires were too long, too complex (number of options), and at a too high reading level. In response to this serious criticism, members of the ETS staff revised the preliminary questionnaires for the Spring semester administration in the first demonstration year. The number of items was reduced, options were limited to two or three, and items that had been somewhat complex were rewritten in simpler language. The revised questionnaire was fairly well received, but several narrowly focused suggestions were used to make a final revision for the 1975-76 demonstration year. The revised questionnaires were received very well in the second demonstration year and instructors were personally anxious to receive summaries of their students' responses to the questionnaires. Summaries were provided to every participating instructor and served as an incentive for teacher participation.

The final revisions of the student questionnaires resulted in two questionnaires, one for PLATO students (45 items) and one for non-PLATO students (35 items). The first 25 items were identical in both questionnaires: 11 items were related to the use of computers and computer-assisted instruction, and 14 items were related to the students' attitudes toward the particular course. PLATO students then responded to 20 questions specifically about their PLATO instruction.

In order to provide information regarding possible contamination of the sample, non-PLATO students were asked questions about any interaction they may have had with the PLATO system or any opinions they had about the PLATO system because of student or teacher comments. The data from these questionnaires provided the possibility of performing a comparative study as in the area of achievement with basically the same design (using the responses to the 25 identical items by PLATO and non-PLATO students) and providing descriptive information based on the unique additional items. The same student questionnaires were administered across all subject areas and colleges thus allowing for considerable pooling of data in the analyses.

Observation instrument. Although the data collected on-line by the PLATO system provided a reasonable picture of the extent of usage of the system and the wide variation in usage and content across and within classes, that data did not provide a description of what occurred in the PLATO laboratory during instruction. In order to provide such information, members of the evaluation staff developed an observation instrument designed to provide a much richer description of the PLATO system in actual use. Observers were trained to collect both objective (numbers of terminals operating, number of students working in pairs, activities of teachers, etc.) and subjective (judge student levels of attention, frustration, etc.) data. These data were collected for the class as a whole and for individual students selected at random.

In the Fall 1975 semester, the observation plan called for observing every PLATO teacher who was participating in the evaluation at least once during the semester. Two students in each class were chosen at random for closer, more detailed, observation. As the semester progressed, the number of individual students was increased from two to three. Preliminary results of the observations were reviewed toward the end of the Fall semester. Although the results were interesting and provided a reasonable description of the PLATO system in use, the data did not allow for interpretation across time for particular classes.

In the Spring 1976 semester, the observation plan was revised to include the observation of approximately 30 specific classes at three distinct points in time: the beginning, middle, and end of the semester. These data provided the opportunity of describing not only the use of the system, but changes in the use of the system over time and changes in student behavior and attitudes over time.

The validity of the observation instrument can be justified in terms of its review by staff members at NSF, CERL, and several community college staff members at the local sites. The PLATO system was rather unique and, although some activities performed in the PLATO laboratory were obvious, easily observed, and evidently important, decisions about what activities to include in the observations had to be made. In general, the approach was to err in the direction of collecting more rather than less data. Such activities as the extent of student discussion during the session were included. A perceptive community college staff member suggested that a significant number of students remained beyond the scheduled end of the period to continue their instruction, an activity not ordinarily observed in traditional classes. That particular information was added to the observation instrument later in the Fall 1975 semester and collected carefully in the Spring 1976 semester.

The observation data were collected by four trained members of the ETS evaluation staff. During the first few weeks of the Fall 1975 semester, the four observers worked together in rotating pairs. Each member of a pair observed the same PLATO laboratory session and completed an observation instrument independently. Agreement between observers on factual information was virtually perfect, but subjective ratings of classes and individual students varied. Debriefing sessions were held to discuss disagreements and arrive at consensus on the criteria to be used in completing the rating scales. On eleven rating scales, observers agreed within one unit on the scale in 89% of the ratings in the final set of pairings. At that point, observations were performed by only one observer.

The subjective scales used in the observation instrument were the following:

(a) For the class as a unit:
  (1) student attention - rated from low to high on a five point scale (concentrate on instruction, avoid distraction, take notes, work problems, request assistance)
  (2) student attitude - rated from negative to positive on a five point scale (serious, enthusiastic, interactive, cooperative with instructor and site personnel are positive factors; ignoring instruction, talking to other students about unrelated matters, leaving early, not signing on in a reasonable time, complaining, boredom, reading newspapers and magazines are negative factors)
  (3) student-student interaction - rated from none to "a great deal" on a five point scale (discussing the PLATO instruction or related content matter, assisting another student, asking another student for help, duration, number of students participating)
  (4) lesson access problems - rated from none to many on a five point scale (sign-on, passwords, course codes, use of indices, problems in getting into a particular lesson, unintentionally signing out of a lesson)
  (5) facility with terminals - rated from poor to excellent on a five point scale (typing skill, use of help-type keys, calculating on the terminal, proper sign-off procedure, erasing, editing, return to index, use of arrows, etc.)

(b) For the individual student (chosen at random):
  (1) attention - rated from inattentive to very attentive on a five point scale

(2) enthusiasm - rated from bored to enthusiastic on a five point scale

(3) composure - rated from tense to relaxed on a five point scale

(4) activity - rated from inactive to active on a five point scale

(5) confusion - rated from not confused to very confused on a five point scale

(6) frustration - rated from not frustrated to very frustrated on a five point scale

The six scales for rating individual students were admittedly subjective. They were chosen on the basis of preliminary observations in the first demonstration year and on intensive observations at the beginning of the Fall 1975 semester. The last four scales were added to the preliminary observation instrument as a result of the first few observations performed by paired observers. It was clear that some students were in fact tense, inactive, confused, and frustrated. The evaluation staff considered this information useful if it could be reliably collected. Observer agreement indicated that it could be so collected. In addition, the evaluation staff considered changes in these student characteristics across time an interesting and informative variable to report on in the overall evaluation of the demonstration of the PLATO system.

Instructor questionnaires. In order to assess the impact of the PLATO system on community college instructors and to provide supplementary information for use in interpreting the student outcome data, PLATO instructors were asked to complete a questionnaire to describe their teaching experience, their experience with the PLATO system, their strategies in using the system, their opinions about the varied components of the system, their commitment to the PLATO system, the impact of the system on their workload and teaching activities, and their subjective ratings of the impact of the PLATO system on student achievement, attitudes, dropout behavior, interaction with the instructor and other students, and on their own faculty duties and responsibilities. In addition, instructors who served as their own controls in the evaluation were asked to complete a second questionnaire comparing their PLATO and non-PLATO classes on motivation, ability, achievement, attendance, time consumed for instruction, teacher-student contact, and anticipated and final preference for teaching. Non-PLATO instructors were asked to complete a questionnaire describing their experience, if any, with the PLATO system and their general opinions about the impact of the system on students and other faculty members. Additional information was collected from instructors through informal interviews and personal communications.

On-line data. The PLATO system had the capability of collecting a significant amount of data at the individual student level depending upon the way the lessons used by the students were programmed. In many courses, the following data were collected by the developers and shared with the evaluation staff:

1. name of the lesson entered
2. time in the lesson in minutes
3. number of arrows encountered by the student
4. number of responses to arrows judged correct
5. number of correct responses on the first try
6. number of incorrect responses anticipated by the author of the lesson
7. number of "incorrect" responses not anticipated by the author of the lesson
8. number of times help was requested and given
9. number of times help was requested and not given
10. number of areas attempted in the lesson
11. number of areas completed
12. number of interactions per minute

The arrows referred to in numbers 3 and 4 above are generally used to elicit a student response. The interpretation of these data depend on the nature and design of the particular lesson being studied. The data were primarily intended for use by the development staff in validating and revising lessons. For example, if large numbers of students requested help at a point in the lesson where such requests had not been anticipated by the author of the lesson, a help sequence might be inserted into the lesson at that point.

The evaluation staff explored these data in 15 lessons for patterns of usage across lessons and for consistent patterns of relationships with student achievement and aptitude. Data matrices which included the on-line measures together with grades, pretest scores, and posttest scores were factor analyzed. No consistent patterns appeared across lessons. Interpretation of the data for specific lessons was unwarranted given that lessons were revised during the demonstration period, the bias in the data due to doubling up of students was unknown, achievement measures were not lesson specific in this evaluation, and the independence of the on-line measures from such variables as attendance and time spent in other instructional activities could not be verified.

The experience gained in exploring these data, however, indicate that future small well-designed studies of individual lessons or groups of lessons would be feasible. In such a situation, instructors would be required to use prescribed PLATO materials under controlled conditions in their instruction.

Miscellaneous reports. A substantial amount of additional data in this project has been collected by attendance of the evaluation staff members at a variety of organizational and working meetings. In each subject area, teams of instructors met regularly to review and develop lessons. Virtually all of these meetings were attended by a member of the ETS evaluation staff and minutes of each meeting were recorded. Organizational meetings between CERL staff and local site personnel were also attended and summaries prepared. In addition, the CERL development staff published many reports giving lists and descriptions of lessons, results of lesson validation activities, usage statistics, and a comprehensive summary of case studies performed in their own internal evaluation. The community college staff also published reports with detailed site information. Weekly schedules were made available to the evaluation staff. Finally, several instructors performed studies of their own and made these available to the ETS evaluation staff.

In general, the sources of data in this project were many and varied. In attempting to describe the implementation and demonstration accurately, and to interpret data validly, the evaluation staff derived information from all possible appropriate sources. Every effort has been made to identify and acknowledge the source of information in the body of the evaluation report.

3.3 Analysis framework

The analyses employed in the evaluation report ranged from simple summaries of descriptive statistics to sophisticated strategies using the comparative data resulting from the basic evaluation designs previously described. In the following sections, the analysis framework is described in detail for each of the outcome areas separately.

Attrition. The basic evaluation designs given in Tables 3.1.1 and 3.1.2 were used to analyze attrition data. The primary unit of analysis was the student. The data sources were the rosters of students who took the pre- and posttests (or last topical test in the case of chemistry), official class rosters provided by the schools at the beginning and end of the semester, and supplementary rosters provided by individual instructors. Although the basic measure of attrition was the percentage of those students who after having taken the pretest subsequently took the posttest, other measures based on the official rosters of the schools and supplementary rosters provided by teachers were examined to ensure the validity of the basic measure. The community colleges participating in the PLATO study differed in their approaches to providing student withdrawal information. In some cases, students were allowed to withdraw right up to the end of the semester. Such students may have taken the posttest. Others may not have. In a few cases, instructors exempted students from the final examination (the posttest) if they had met some agreed upon criteria. In some cases, instructors did not arrange for absent students to make up the pretest. In some cases, students took the pretest and withdrew during the period when withdrawals were allowed without formal withdrawal procedures. Such students simply disappeared from the rosters and were not listed as formally withdrawn. All of these factors were considered in the analysis of the attrition data.

Assuming a valid measure of attrition, the basic design permitted a comparison of attrition rates across subject areas within colleges, within subject areas across colleges, within subject areas within colleges, and across sections within course areas within colleges. The yoked study also provided the opportunity to compare the attrition data across treatment and control groups for identical teachers thus providing a control on teacher effects which are so critical in any analysis of educational outcomes.

The pretest data also provided the opportunity for a detailed analysis of differential attrition based on initial student ability across treatment and control conditions for appropriate groups of students. Within the analysis framework, the pretest scores for those students who did not subsequently take the posttest were compared with the pretest scores of those who did subsequently take the posttests. The yoked design again permitted this data to be interpreted with teacher effects taken into consideration.

Achievement. Evaluating the impact of the PLATO computer-based education system on student achievement was the most challenging aspect of the overall evaluation of the PLATO system. Student learning is undoubtedly the bottom line in education, and educational systems of any kind are simply means to bring about that end. On the other hand, the PLATO system was admittedly in a developing state. Therefore, what expectations for it were reasonable? The answer to this question will depend on the expectations and prejudices of the reader. The developers of the system claimed that PLATO was ready to demonstrate its capabilities. However, their emphasis was on getting the system in place and working efficiently. The essential role to be played by instructors in determining how to use the system and even in developing the materials (courseware) to be used in conjunction with the system was stressed. If it could be shown across all subject areas and all colleges that the students who used the system achieved much better than those who did not, then it would be easy to assign the credit for successful improvement in achievement to the PLATO system. If, on the other hand, it could be shown across all subject areas and all colleges that students who used the system achieved much more poorly than those who did not, then it would be easy to blame the system in general but difficult to assign the cause of failure to specific components of the system. These simple results seldom occur in education.

Rather, given the substantial variation in the way that the PLATO system was used, as was demonstrated in Chapter 2, one must be prepared for a complex and not unambiguous set of outcomes in the area of achievement.

The complex results have been presented within the context of the basic evaluation design using a basically straightforward analysis strategy. Although the analysis strategy was applied to specific cases where students took the same pre- and posttests, it is useful to have the general approach stated explicitly before it is applied to the specific cases and modified by the varying constraints imposed by each population of interest.

The general approach to the analysis consisted in the estimation of the parameters of a model, corresponding estimates of the standard errors of the parameter estimates, and appropriate statistical tests of the significance of differences between appropriate parameter estimates. Thus, the initial problem was to specify the mathematical model and to identify the parameters to be estimated. It was assumed that (1) there were well defined treatment (T) and control (C) conditions, (2) each subject was in one of these conditions, and (3) some time after the initiation of the T and C conditions the value of a dependent variable (Y) was obtained for all subjects. The basic conception of the effect of the treatment follows Rubin (1974) in which the critical (but unmeasurable) quantity of interest is, for each subject, the difference between the value of Y he would have in the T condition and the value he would have in the C condition.

It is, of course, impossible to have each subject in both the T and C conditions in this study. Therefore, as an approximation, it is necessary to compare the values of Y for subjects in the T condition with the values of Y for "similar" subjects in the C condition. In order to talk about subjects being "similar," it is necessary to introduce the notion of a covariate. In this study, a covariate is any quantity which is measured on every subject before the initiation of the T and C conditions (or which would not be changed by the T or C conditions, such as age or sex). The vector of all such covariates is denoted by X. Two subjects with identical values of X are considered "identical" as far as the relevant set of data is concerned--they are the same on every characteristic measured prior to the initiation of the treatment.

There is one final concept that needs to be introduced before the model can be stated, and that is the population P from which the subjects are to be regarded as representative. In this study, there are a number of populations of potential interest, the students in a particular course within a school, the students in similar courses within and across schools. The problem of pooling subpopulations across classrooms, courses, schools, and even the T and C conditions, is both substantive and statistical. In the substantive area, if the posttests are different even for seemingly identical courses, pooling populations is not possible. At the statistical level, it is possible to "pool" across groups if some version of parallel response functions in the groups can be justified. The reason for pooling is to increase the relative sample size and thereby improve the parameter estimates. Thus, to summarize, the primary population in this study is the set of students in a class who take and finish a given course in a given college. When appropriate, pooling will be used to specify larger relevant populations. The actual pooling will differ in the five subject areas of interest in this study.

To specify the mathematical model, the dependent variable Y and the vector of covariates X are regarded as having a joint probability distribution over the population P, and this distribution depends on whether the subjects are in the T or C condition. Conditional on X, Y has a distribution which depends on the condition that the subject is in. The average value of Y for subjects from P with covariates $X = x$ who receive the treatment T is denoted by

$$\mu_T(x) = E_P(Y|X = x,T).$$

Similarly, the average value of Y for subjects from P with covariates $X = x$ who receive the control condition C is denoted by

$$\mu_C(x) = E_P(Y|X = x,C).$$

The functions $\mu_T(x)$ and $\mu_C(x)$ are sometimes called the response functions. Since they represent the average values of Y in the two conditions (T or C) for subjects from P with identical covariate values x, their difference

$$\tau(x) = \mu_T(x) - \mu_C(x)$$

is the average difference in the value of Y for "identical" subjects (i.e., those whose covariate values are both equal to x). The expression $\tau(x)$ is the "treatment effect at x." If $\tau(x)$ is averaged over the population P, then the "treatment effect in the population P" is denoted by

$$\tau_P = E_P(\tau(X)).$$

The purpose of the analysis is to estimate for each population P and dependent variable Y the treatment effect τ_P. If the estimate of τ_P is denoted by $\hat{\tau}_P$, then $\hat{\tau}_P$ will have a distribution with standard error $\sigma_{\hat{\tau}_P}$. The estimate of this standard error will be denoted by $\hat{\sigma}_{\hat{\tau}_P}$. For each population, the analysis will report the values of $\hat{\tau}_P$ and $\hat{\sigma}_{\hat{\tau}_P}$.

The analysis will be carried out in three stages. In stage I, for a given population P, the response functions $\mu_T(x)$ and $\mu_C(x)$ will be estimated. It is not necessary that the response functions be linear and/or parallel. If they are, the analysis will be appropriately simplified. In this stage, exploratory analysis will be used in an attempt to simplify the response functions by transforming variables and examining the effects of outliers. If parallel response functions can be justified, then appropriate "pooling" will be done in stage I to permit better estimates of $\hat{\tau}_P$ and $\sigma_{\hat{\tau}_P}$.

In stage II, the estimated response functions $\hat{\mu}_T(x)$ and $\hat{\mu}_C(x)$ will be used to estimate the "treatment effect at x"

$$\hat{\tau}(x) = \hat{\mu}_T(x) - \hat{\mu}_C(x).$$

This is the best estimate of the average increase (or decrease) in Y due to T for subjects with covariate values x. In general, the analysis will entail computing $\hat{\tau}(x_i)$ for every observation i in each application of the model and averaging the values to obtain the final estimate of the treatment effect.

In stage III, the estimated standard error $\sigma_{\hat{\tau}_P}$ is computed using the standard error of regression in the T and C groups, the functional forms of $\hat{\mu}_T(x)$ and $\hat{\mu}_C(x)$, and the number of individuals and corresponding covariate values used in determining $\hat{\tau}_P$, the estimated treatment effect.

The preceding description of the analysis strategy was purely mathematical and statistical and therefore devoid of substantive content. Y, X, P, T, and C were abstract entities related to each other in ways that are independent of any interpretation they might have in specific contexts. In dealing with the real data, substantive interpretations will be given to each abstract entity.

In applying the previously described mathematical model and statistical strategies to the community college component of the PLATO study, very concrete and specific meanings are given to Y, X, P, T, and C. By referring to the basic evaluation design in Table 3.1.1, the reader will note that distinct letters have been used to designate specific courses in specific colleges. There are 19 basic populations of interest. In 13 of these populations, different posttests were used to insure valid assessment of student achievement and thus no pooling is possible. In the six English courses, the same pre- and posttests were administered so there is a possibility of pooling across courses and colleges. Therefore, in discussing the impact of PLATO on student achievement, there are between 13 and 19 populations of interest to be considered. The numerals used in the basic evaluation design are used to designate instructors. It can be seen that some instructors served as their own controls. This aspect of the design permits the analysis to examine the data for populations in which the confounding of teachers and treatment is controlled. In cases where it is appropriate, the treatment effect will be determined additionally for identical instructors only. If all English classes are pooled, then the yoked design permits an additional analysis to be made in seven of the 14 relevant populations.

The dependent variable Y is the student's score on the posttest (or a topical test in chemistry). This score is expressed in terms of number of items answered correctly. Therefore, $\hat{\mu}_T(x)$, $\hat{\mu}_C(x)$, and the difference $[\hat{\mu}_T(x) - \hat{\mu}_C(x)]$ will all be expressed in terms of number of items. The treatment effect therefore will be clearly interpretable, i.e., "in the relevant population, students in the treatment condition score k items more or less than students in the control condition."

The covariates X are variables measured before the beginning of the treatment. In attempting to determine the response functions, it is important to consider those variables on which the dependent variable Y depends. There is no doubt that final achievement Y depends on initial ability in the educational system as it is presently constituted. Thus, the evaluators considered the collection of pretest data essential to the evaluation.

In some of the analyses, an additional covariate based on certain instructors can be used to account for teacher effects in estimating the response functions. This additional covariate is defined in the following way. In a particular population P, instructors fall into three cases:

(1) Case 1 - teaches only T or only C classes,

(2) Case 2 - teaches both T and C classes and there is not at least one other instructor in each condition,

(3) Case 3 - teaches both T and C classes and there is at least one other instructor in each condition.

For a given population P, let

$$S_i(j) = \begin{cases} 1 \text{ if student } j \text{ has instructor } i \\ 0 \text{ otherwise.} \end{cases}$$

If the T and C groups are considered together, then

(1) for Case 1 teachers, S_i takes on only the value 0 in the condition in which instructor i is not teaching

(2) for Case 2 teachers, S_i takes on only the value 1 in the condition in which instructor i is the only instructor

(3) for Case 3 teachers, S_i takes on two values in both conditions (i.e., 1 for students who have instructor i, and 0 for students who do not).

Therefore, for Case 3 teachers, S_i is a variable in both conditions and the dependence of the response functions ($\mu_T(x)$ and $\mu_C(x)$) on S_i can be estimated. It can be noted in the basic evaluation design, Table 3.1.1, that there are 24 such Case 3 instructors whose teacher effects can be unambiguously estimated.

Finally, in the area of English the dependent variable Y is common across the six college-course populations. If these six potentially different populations are denoted as A100, A101, B101, C100, C101, and D (where A, B, C, and D correspond to Colleges I, II, III, and IV), then the "pooled" data can be used to estimate the response functions for all six populations by using indicator variables. The variable A100 is defined as follows:

$$\text{A100} - \text{D} = \begin{cases} 1 & \text{if the student is in A100} \\ -1 & \text{if the student is in D} \\ 0 & \text{otherwise.} \end{cases}$$

The other four required indicator variables are defined in a similar manner. Only five variables are required using these definitions because D is simply a linear combination of the five defined variables. For simplicity of notation, let R_i denote the five college-course indicator variables for $i = 1, 2, \ldots, 5$.

If the pretest scores are denoted by PRE, the teacher variables by $\{S_j\}$, and the college-course variables by $\{R_i\}$, then the response functions are of the form

$$\mu_T(\text{PRE}, \{S_j\}, \{R_i\}), \text{ and}$$
$$\mu_C(\text{PRE}, \{S_j\}, \{R_i\}).$$

The actual variables that enter into the estimation procedure will be dependent on the characteristics of the specific population in the analysis. The variables $\{R_i\}$ only enter into the English analysis.

The analyses will be carried out by fitting the following simplified forms of the response functions to the data for each relevant population:

$$\mu_T(X) = b_0 + b_1(\text{PRE}) + \sum_j c_j S_j + \sum_i d_i R_i + e$$

$$\mu_C(X) = b_0 + b_1(\text{PRE}) + \sum_j c_j S_j + \sum_i d_i R_i .$$

These simplified forms assume that the slopes on PRE are identical in all subpopulations and in the T and C groups. This is a testable hypothesis. If it is not justified, then more complicated forms of the response functions will be examined. If the hypothesis is justified then e will be identical to the previously defined treatment effect $(\mu_T(x) - \mu_C(x))$. This pair of response functions will be estimated by regressing the dependent variable Y on the independent variables PRE, $\{S_j\}$, $\{R_i\}$, and PLATO, where

$$\text{PLATO} = \begin{cases} 1 \text{ if the student is in T} \\ 0 \text{ if the student is in C.} \end{cases}$$

If the simple model can be justified, then the estimated treatment effect

$$\hat{\tau} = \frac{1}{n} \sum_i (\hat{\mu}_T(X_i) - \hat{\mu}_C(X_i))$$

is simply $\hat{e}$ and is given directly from the regression analysis. In addition, $\hat{\sigma}_{\hat{\tau}} = \hat{\sigma}_{\hat{e}}$, and $\hat{\sigma}_{\hat{e}}$ is given directly from the regression analysis. By repeating the analysis using only instructors who served as their own controls, a second estimate of τ and σ_τ will be obtained to verify the effect with more appropriately "matched" instructors. If the estimates agree, this will provide evidence to reject the obviously plausible alternative hypothesis that any perceived effect is simply due to more effective teachers in one of the conditions.

The analysis strategy outlined above will be applied to all populations P in the Fall 1975 semester and the Spring 1976 semester.

Attitudes. The framework for the analysis of student attitudes was both descriptive and comparative. At the descriptive level, the data obtained from student questionnaires were summarized for PLATO students and non-PLATO students separately. The attitudes toward and opinions about the use of PLATO were summarized at the item level within courses across colleges, within colleges across courses, and across all courses and colleges. Items related to satisfaction with instruction and the use of computers in general were given to both PLATO and non-PLATO students. Comparisons of summary data across the T and C conditions will be presented at the item level.

Instructor attitudes and opinions were summarized for PLATO and non-PLATO instructors within and across colleges. No comparative analyses were performed in this area.

Behavior. The analyses in this area were basically descriptive. The evaluation plan provided for both data descriptive of the PLATO demonstration in general and data that could be interpreted to show trends in behavior across time. The descriptive analysis was performed at both the class level and the individual student level. Classes across subject areas and colleges were observed. Students in each class were chosen at random for detailed observation.

On-line data. Tables such as those presented in Chapter 2 provided the basis for the descriptive analysis of the on-line data. In addition, the analyses strategies in this area have included factor analyses of specified lessons with an attempt at developing measures of usage other than simple time-on-line. These measures have been related to student achievement to explore relationships between types of usage and achievement. The analyses strategies were based on correlations and factor analyses.

Miscellaneous outcomes. No specific framework was developed for the analysis of side effects and miscellaneous outcomes other than to resist a narrow and circumscribed conception of goals, objectives, and outcomes. The PLATO implementation was broad and varied. The evaluation was similarly broad and varied. Anecdotal descriptions have been presented of as many events as can reasonably be included as outcomes of the PLATO implementation and demonstration.

3.4 Summary

The evaluation plan is comprehensive and varied. When appropriate, as in the areas of achievement and attrition, a quasi-experimental design has been implemented and a comparative analysis performed. In other areas, descriptive data and anecdotal reports are used to assess outcomes. An attempt has been made to include side effects and a variety of outcomes not measurable in the usual technical sense.

Chapter 4

Student Attrition

Community colleges provide opportunities for students to continue their education beyond the high school level. Many students who take advantage of these opportunities by beginning the process drop out at one stage or another before completing the process. Although there are many reasons for student attrition in classes, courses, and colleges, it was hoped that PLATO might reduce a student's inclination to discontinue his or her studies by providing individualized instruction, immediate feedback, and the opportunity to make errors and correct them in a non-threatening and non-embarrassing context. This chapter provides information about the impact of PLATO on student attrition in the five targeted subject areas in the participating colleges.

4.1 Definition and measurement of attrition

Attrition is defined as the complement of completion. If 75 of 100 students begin and complete a course, the completion rate is 75% and the attrition rate is 25%. For purposes of clarity, the following discussion employs completion terminology rather than attrition terminology. A student who begins a course in a specific class, remains in that class during the course, and finishes the course in that class is a student who has "completed the course in that class." Students who enter a class after the beginning of the course are not considered.

The definition of completion as "beginning, remaining in, and finishing a course in a specific class" is a restrictive but appropriate one for the evaluation. Initial contacts with instructors and administrators indicated that attempts to follow up students to determine whether they had completely dropped out of school or had simply changed courses or classes would be difficult if not impossible. This proved to be the case when the evaluators subsequently attempted to obtain information about reasons for changes from students who dropped out of classes.

Before a measure of completion could be developed, it was necessary to operationalize the definition by assigning clear meanings to the words "begin" and "finish." In the community colleges, more students were listed on the official class rosters than actually showed up at the beginning of classes. There appeared to be two common reasons for this. Some students enrolled, then their plans changed, and they did not matriculate. Some students enrolled in more classes than they intended to take in order to keep their options open. It was therefore clear that official class rosters could not be used alone to determine whether or not a student had begun a course. It was necessary to work closely with participating instructors in order to obtain this information accurately. Pretests were administered to participating classes during the first or second week of class before instructors began utilizing the PLATO system. Students who took the pretest were clearly present in the class. Due to the voluntary nature of the participation, however, and the attendance rates in the colleges, the evaluators were concerned about students who might have been missed in the pretesting. A list of the students tested in each class was sent to each participating instructor for review. Instructors were asked to add names of students who were members of the class and did not take the pretest. The results for both PLATO and non-PLATO classes were similar. On the average, two students were added to class lists. However, instructors did not always identify those students who had entered the class later in the semester, and some instructors did not return the class lists. The number of students who took the pretest was judged to be the best measure for the purposes of the evaluation of the number of students who "began" the course in a specific class.

Most instructors used the posttests as part of their own testing program. A review of the final grade lists showed that few students who did not take the posttest received passing grades. In conferring with instructors, it was discovered that a few students had been excused from the final examinations. There were some students who took the posttest and received failing grades. There were also some students who took the pretest and posttest and were listed as withdrawals on the final grade rosters. In at least one college, students were allowed to withdraw at the end of the course if they suspected they would receive a failing grade. Unfortunately, the data is not sufficiently detailed to permit a distinction between students who did not take the posttest and withdrew at the end of the course and students who withdrew before the end of the course. Therefore, after examining the possible data sources, the following definition of completion was used in the evaluation: a student is considered as "completing the course in a specific class" if the student took the pretest and subsequently took the posttest in that class. The completion rate for a class was the percentage of those students who after having taken the pretest in a class subsequently took the posttest in that same class.

4.2 Description of the data

For each of the students pretested in the Fall 1975 semester or the Spring 1976 semester, three basic items of data were available: the student's pretest score, treatment status (PLATO or non-PLATO), and completion status (completed or attrited). Student pretest scores were considered a part of the data base in order to take into account the following two hypotheses: (a) completion is dependent on student ability and differences in completion between PLATO and non-PLATO groups may result from corresponding differences in student ability, and (b) there is an interaction between PLATO and student ability resulting in differential attrition in the treatment and control conditions. Although the analyses showed that the second hypothesis could be rejected, the first could not. In some courses, completion was significantly dependent on student ability. Therefore, it was necessary to determine the effect of PLATO on student attrition with initial ability taken into consideration. As a result of the dependence of completion on ability, and the necessary consequence that pretest scores be considered an essential part of the data base, the analyses must be performed separately for students taking common pretests. In addition, preliminary analyses indicated that the dependence of completion on ability differed even in courses with common pretests. Therefore, the data base could be most appropriately considered in terms of the 19 basic populations shown in Table 3.1.1 for the Fall 1975 semester and the 13 basic populations shown in Table 3.1.2 for the Spring 1976 semester.

To summarize, the data for the study of attrition consisted of 32 sets of data as illustrated in Table 4.2.1. The numbers listed are the numbers of students pretested in each of the populations.

Table 4.2.1

Data Base for The Study of Completion

	College I		College II		College III		College IV	
	P	NP	P	NP	P	NP	P	NP
A. Fall 1975 Semester								
Business 101	23	30	23	17	141	89		
Biology 101, 111	224	101	46	45				
Biology 102, 112	80	78			125	85		
Chemistry 101, 121	33	31	78	57	67	40	66	67
Chemistry 201			58	9				
English 100	81	77			76	99		
English 101	70	126	102	122	47	115	46	28
Math 111	49	62						
B. Spring 1976 Semester								
Business 101	24	32			73	64		
Biology 111	95	65						
Biology 102, 112	58	55	22	33	49	23		
Chemistry 121			46	22				
English 100	74	72			24	19		
English 101	123	65	43	53	18	19		
Math 111	45	54						

P = PLATO
NP = Non-PLATO

4.3 Analysis of the data

The basic analysis strategy is similar to that explained in section 3.3 for achievement. The parameters of a mathematical model are estimated and differences between estimates for the treatment and control groups are tested for significance. Because students cannot be in both the T and C conditions, the notion of covariate is used to define "similar" students in the T and C conditions. The primary population is the set of students in a class who take the pretest.

The dependent variable Y is defined as follows:

$$Y_i = \begin{cases} 1 \text{ if student } i \text{ is pretested and posttested.} \\ 0 \text{ if student } i \text{ is pretested but not posttested.} \end{cases}$$

The covariate X is the student's score on the pretest. The dependent variable Y and the covariate X are regarded as having a joint probability distribution over the population P, and this distribution depends on whether students are in the T (PLATO) or C (non-PLATO) condition. The average value of Y for students from P with covariate X = x who receive the treatment is defined by

$$\mu_T(x) = E_p(Y|X = x,T).$$

This function can be interpreted as the probability that a student with a given pretest score of x in the PLATO condition completes the course. Similarly, the average value of Y for students from P with covariate X = x who receive the C condition is denoted by

$$\mu_C(x) = E_p(Y|X = x,C).$$

The functions $\mu_T(x)$ and $\mu_C(x)$ are sometimes called the response functions. Since they represent the average values of Y in the two conditions (T and C) for subjects from P with identical covariate values x, their difference

$$\tau(x) = \mu_T(x) - \mu_C(x)$$

is the average difference in the value of Y for "identical" subjects. The expression $\tau(x)$ is the "treatment effect at x." If $\tau(x)$ is averaged over the population P, then the "treatment effect in the population P" is denoted by

$$\tau_P = E_P(\tau(X)).$$

The purpose of the analysis is to estimate τ_P for each population P. If the estimate of τ_P is denoted by $\hat{\tau}_P$, then $\hat{\tau}_P$ will have a distribution with standard error $\sigma_{\hat{\tau}_P}$. The estimate of this standard error will be denoted by $\hat{\sigma}_{\hat{\tau}_P}$. For each population, the analysis gives $\hat{\tau}_P$ and $\hat{\sigma}_{\hat{\tau}_P}$.

Although the dependent variable Y is the same in all courses and colleges, the covariate X (pretest) is different in most courses. Therefore, the analyses were carried out separately by course within college for each college, thus resulting in estimates of τ_P and σ_P for the 19 basic populations in the Fall 1975 semester and for the 13 basic populations in the Spring 1976 semester.

The analyses were carried out by fitting the following simplified forms of the response functions to the data for each relevant population:

$$\mu_T(X) = b_0 + b_1 X + e$$
$$\mu_C(X) = b_0 + b_1 X .$$

These simplified forms assume that the slopes on X (pretest scores) are the same in the T and C groups. This hypothesis will be tested. If it is not justified, then more complicated forms of the response functions will be examined. If the assumption is justified, then e is identical to the previously defined treatment effect $(\mu_T(X) - \mu_C(X))$. This pair of response functions will be estimated by regressing the dependent variable Y on the independent variables X (pretest scores), and PLATO, where

$$\text{PLATO} = \begin{cases} 1 \text{ if the student is in T.} \\ 0 \text{ if the student is in C.} \end{cases}$$

If the simple model can be justified, then the estimated treatment effect

$$\hat{\tau} = \frac{1}{n} \sum_i (\hat{\mu}_T(X_i) - \mu_C(X_i))$$

is simply $\hat{e}$ and is given directly from the regression analysis. In addition, $\hat{\sigma}_{\hat{\tau}} = \hat{\sigma}_{\hat{e}}$, and $\hat{\sigma}_{\hat{e}}$ is given directly from the regression analysis.

In order to verify equal slopes in the treatment and control conditions, a pretest by PLATO term was introduced in each regression for the 32 populations. This preliminary analysis showed no significant interactions between PLATO and student ability. The simplified model of the response function thus appeared to be justified. However, the dependence of completion on ability was significant in a number of the populations. In such cases, the coefficient of the PLATO term represents an adjusted difference in attrition rates between PLATO and non-PLATO classes. When the dependence of completion on ability is not significant, the simple difference between completion rates in the PLATO and non-PLATO classes is as equally plausible a measure of difference in completion as the coefficient of the PLATO term in the regression.

4.4 Results of the analysis

In Table 4.4.1, the regression coefficients for the pretest and PLATO terms are given with corresponding t-statistics for each. Before considering the size of the PLATO effect in each population, it is useful to examine the directions of the coefficients. Note that 23 of the 32 pretest coefficients are positive. This is relatively conclusive evidence that completion is positively related to initial student ability, an expected finding. In ten populations, this result is significant at the .05 level ($t \geq 1.96$). Actually, assuming that we had good reason to believe that the direction was positive to start with (which we did), we can use a one-tailed test and a t-value greater than 1.70 as denoting a significant result. The value $t = 1.70$ is the limiting value of t for $p \leq .05$ with 30 degrees of freedom. This would be a conservative estimate given that our populations are relatively large. This does not change the result appreciatively, but it provides a context for examining the PLATO effects.

We had no reason to believe that PLATO would effect student attrition in a given direction, positively or negatively. Therefore, a two-tailed test can be used when examining the PLATO effects. In the 32 populations, the direction of the estimated PLATO effect is divided about evenly in the positive and negative directions

Table 4.4.1
Completion Analysis

A. Fall 1975 Semester

			Pretest		PLATO	
Course	College	n	b_1	(t)	τ	(t)
Accounting 101	I	53	.0016	(0.12)	-.2684	(-2.19)
	II	40	.0246	(1.60)	-.0599	(-0.40)
	III	230	.0272	(4.06)	.0482	(0.71)
Biology 101	II	91	.0180	(2.44)	-.0142	(-0.14)
Biology 102	III	210	.0149	(2.09)	-.0103	(-0.15)
Biology 111	I	325	.0004	(0.10)	.0327	(0.56)
Biology 112	I	158	.0186	(2.36)	.4023	(5.59)
Chemistry 101	IV	133	.0201	(2.59)	.0025	(0.03)
Chemistry 121	I	64	.0505	(2.33)	-.1552	(-1.26)
	II	135	.0126	(1.38)	.0659	(0.74)
	III	107	-.0030	(-0.28)	-.0810	(-0.82)
Chemistry 201	II	67	.0191	(1.80)	.0312	(0.19)
English 100	I	158	-.0012	(-0.22)	.0992	(1.25)
	III	175	.0046	(0.94)	-.0451	(-0.60)
English 101	I	196	.0022	(0.45)	.0282	(0.38)
	II	224	.0029	(0.66)	.1435	(2.19)
	III	162	.0033	(0.60)	.1696	(2.01)
	IV	74	-.0039	(-0.67)	-.0100	(-0.15)
Mathematics 111	I	111	.0119	(2.57)	-.1496	(-1.59)
B. Spring 1976 Semester						
Accounting 101	I	56	.0036	(0.28)	.0137	(0.11)
	III	137	.0215	(2.50)	-.0946	(-1.18)
Biology 102	II	55	.0395	(3.33)	-.1401	(-1.24)
	III	72	.0036	(0.31)	.0405	(0.32)
Biology 111	I	160	-.0053	(-0.83)	.1984	(2.58)
Biology 112	I	113	-.0070	(-0.66)	.2029	(2.39)
Chemistry 121	II	68	.0057	(0.36)	-.0196	(-0.14)
English 100	I	146	.0020	(0.35)	.0933	(1.12)
	III	43	-.0016	(-0.15)	.1021	(0.65)
English 101	I	188	-.0007	(-0.15)	-.0302	(-0.40)
	II	96	.0060	(0.93)	.0066	(0.06)
	III	37	-.0142	(-0.90)	-.2329	(-1.35)
Mathematics 111	I	99	.0142	(2.56)	.1467	(1.48)

with 14 estimates in the negative direction and 18 in the positive direction. For 30 degrees of freedom, the limiting value of t at the .05 level is 2.04 for a two-tailed test. Using this value as an estimate of significant effects, 5 of the estimated PLATO effects are significant, 4 in the positive direction and one in the negative direction. This is a greater number of significant effects than we would expect by chance so these significant estimates are worth examining in greater detail.

The only negative effect occurred in Accounting 101 at College I. In this population there were only two classes, each with a different instructor (A1 and A2 in the basic design in Table 3.1.1). Therefore, there is a complete confounding between PLATO and instructor effects. The dependence of completion on ability in this case is negligible, so the simple class completion rates can be examined without taking ability into account. The completion rate in instructor A1's class was 56.5% and that in A2's class was 83.3%. Note that in the case of no dependence on ability, the coefficient of the PLATO term (-.268) is simply the difference in completion rates (-26.8%). In the Spring 1976 semester, these same two instructors (A1 and A2) participated in the evaluation again. The completion rates of both instructors decreased and differed by only 1%. Thus the Fall result was not replicated.

The result in Biology 112 in the Fall 1975 semester can be plausibly accounted for by an instructor effect. Referring to the basic designs in Tables 3.1.1 and 3.1.2, Biology 112 corresponds to course E in College I. There were no identical instructors across conditions in this population. Therefore, the estimated effect cannot be verified with instructor effects controlled. The effect can be accounted for by the effect of instructor E4 on completion. In the Spring 1976 semester, this result was replicated, but with the same instructor (E4) in the control condition. It seems reasonable, in the light of the results in the other populations, to consider this result as an instructor effect. This result actually illustrates the power of the evaluation design. If instructors had not been matched in large part, it is likely that results would have been much more mixed due to differing instructor effects.

The significant effect in English 101 at College II disappeared when the regression was rerun for identical instructors only. The t-value decreased from 2.19 to 1.65. This effect can therefore be attributed to differing effects of instructors who were not identical across the treatment and control conditions.

The PLATO effect in English 101 at College III in the Fall 1975 semester was marginally significant ($t = 2.01$). This effect remained significant ($t = 2.36$) when the regression was rerun for identical instructors only. It was also replicated for each identical instructor (M1 and M2) separately. This effect can be plausibly attributed to PLATO. However, it is the only significant effect that cannot be explained apart from PLATO. Furthermore, it was not replicated in the Spring semester with one of the same instructors participating. Therefore, the effect in the Fall semester represents one positive and significant effect in 32 investigations and can be reasonably considered a chance occurrence.

4.5 Summary

The results of the study of attrition show that PLATO had no consistent effects on student attrition. There were also no significant inconsistent effects that might be explained in terms of differences in the treatment condition. Significant effects that were found were plausibly explained in terms of instructor differences or chance occurrences. Therefore, based on this particular evaluation, the PLATO system had no significant impact on student attrition.

Chapter 5

Student Achievement

The impact of the PLATO system on student achievement was evaluated by implementing the basic evaluation designs given in Tables 3.1.1 and 3.1.2. The validity of the evaluation presumes valid assessment instruments, a valid design, and a valid analysis strategy. Because these three components are so essential to a valid evaluation, they are discussed separately before the data are described in section 5.2.

5.1 Validity of the evaluation

Assessment instruments. Instructors from the various subject areas participated in fashioning the pretests to assess student potential for success in the respective courses. Items were selected from existing ETS tests. In biology, separate pretests were developed for two levels of biology courses. In chemistry, a portion of the pretest included items on mathematical skills because instructors considered such knowledge on the part of students important for success in their chemistry courses. In mathematics, a two part test was developed aimed at assessing arithmetic skills separately from algebraic skills and knowledge of inequalities. The subtests were differentially important in predicting success as was shown in the subsequent analysis. In English, a writing sample which added to the predictive power of the pretest was included. The pretests were field tested in the 1974-75 academic year and revised to insure sufficient time for administration and adequate reliability.

The posttests were designed in accordance with curriculum outlines in each subject area in each college. Instructors participated significantly in fashioning the overall specifications and in selecting the specific items. Content validity necessitated the development of separate tests for most courses even within the same subject areas. These posttests were field tested in the 1974-75 academic year and revised to insure sufficient time for testing and adequate reliability. It was expected that instructors would use the posttests as final examinations. A form of criterion validity for the posttests was determined by comparing student posttest scores with final grades. It was not expected that student grades would be entirely determined by posttest scores, but it was expected that posttest scores would be partially reflected in student grades. Student grades were obtained for approximately 90% of the students participating in the evaluation. Within each class for which grades were obtained, the correlation of grades with posttest scores was determined. In Table 5.1.1, the average within class correlations are given for the treatment and control groups for most of the populations in the study. In chemistry, posttests were administered only in College IV. In other chemistry courses, several topical tests were given at intervals during the course. Validity coefficients were not determined for those courses.

In general, these coefficients show clearly that posttest scores were reflected in student grades. A few coefficients are small and indicate that caution should be exercised in interpreting effects in the analysis. There is one surprising negative coefficient (Spring 1976, English 100, College III). By referring to the basic design, it can be seen that this coefficient corresponds to one teacher in the control condition. A check of the raw data shows that the student who scored highest on the posttest received a failing grade in the course. Only nine students received both grades and posttest scores. Evidently, this instructor did not base grades primarily on student posttest scores. Since the same teacher taught the PLATO section in that population, it is apparent that other variables were at work here and caution is indicated in interpreting the analysis. In general, the validity of the assessment instruments appeared to be strong given the number of different instructors, courses, and colleges targeted in the study.

Design. The evaluation design was basically a combination of "nonequivalent control group designs." The major threats to validity arising from the design were (1) dissimilar treatment and control groups (on the pretest), and (2) interaction of the treatment with other experimental variables. It is clear that treatment was totally confounded with instructors in some cases.

Table 5.1.1

Validity Coefficients

A. Fall 1975 Semester

Course	College	Validity Coefficient PLATO	Validity Coefficient Non-PLATO
Accounting 101	I	.78	.74
	II	.78	.89
	III	.85	.72
Biology 101, 111	I	.67	.65
	II	.81	.75
Biology 102, 112	I	.49	.43
	III	.41	.48
Chemistry 101	IV	.79	.74
English 100	I	.44	.46
	III	.52	.60
English 101	I	.63	.55
	II	.49	.62
	III	.56	.63
Math 111	I	.81	.70

B. Spring 1976 Semester

Course	College	Validity Coefficient PLATO	Validity Coefficient Non-PLATO
Accounting 101	I	.77	.86
	III	.83	.93
Biology 101, 111	I	.53	.52
Biology 102, 112	I	.78	.18
	II	.90	.70
	III	.28	.24
English 100	I	.69	.44
	III	.62	-.77
English 101	I	.65	.43
	II	.52	.74
	III	.76	.22
Math 111	I	.83	.85

When instructors were totally different in treatment and control conditions, it was not possible to distinguish treatment effects from instructor effects. However, there were many instructors and only one treatment. Therefore, if the treatment effect was replicated across many groups of instructors, the effect could reasonably be attributed to the treatment. In addition, the design included many cases in which the instructors, or a subset of the instructors, were identical across treatment and control conditions. This "yoked" nature of the design permitted effects, when found, to be confirmed for more appropriately matched instructors.

Analysis. The basic model and analysis strategy was described in section 3.3. The general approach was to fit a pair of parallel response functions to the data. If linear response functions provided an adequate fit to the data, the analysis was somewhat simplified. However, if non-linear response functions were indicated by the data, the analysis strategy provided an estimate of the treatment effect based on the non-linear functions. If the data indicated the need for non-parallel response functions in the treatment and control conditions, the analysis strategy used non-parallel response functions to estimate the treatment effect. In such cases, the analysis strategy provided information about the reason for the non-parallelism.

In general, the basic model and the analysis strategy were sufficiently flexible to accomodate the data collected. The predictive validity of the model employed in each analysis is indicated in the summary tables. The dependence of posttest scores on pretest scores was generally verified in every application. The dependence of posttest scores on other variables (especially on the treatment) varied from population to population.

5.2 Description of the data

The basic achievement data consisted of student scores on pretests, topical tests, and posttests in the 32 populations shown in the basic evaluation designs in Tables 3.1.1 and 3.1.2. In each population, students were divided into three groups: (a) those who were pretested only, (b) those who were pretested and posttested, and (c) those who were posttested only. Summary descriptive statistics are given in Tables 5.2.1a-5.2.1j in the appendix for each population.

As an illustration of the summary data available for each population, the summary statistics for Accounting 101 at College I are given in Table 5.2.1 in this section. For students who took only the pretest or only the posttest, the corresponding pretest or posttest data are given. For students who took both pretest and posttest, the pretest data are listed first followed by the posttest data. For example, in the summary data for all classes listed toward the bottom of Table 5.2.1, the first row (Pre only) gives the summary pretest statistics for 15 students who took only the pretest, the second row (Pre & Pos) gives the pretest statistics for 38 students who took both the pretest and posttest, the third row (Pos & Pre) gives the posttest statistics for the same 38 students described in the second row, and the fourth row (Pos only) gives the posttest statistics for those students who took the posttest only.

In addition to the means and standard deviations, the table also lists the lowest and highest scores obtained on the pretest and posttest by the group of students being described. The highest possible pretest score was 40, and the highest possible posttest score was 54 (cf Table 3.2.1). The ranges of scores indicate that neither ceiling nor floor effects were present. The mean scores indicate that both tests were at about the medium difficulty level for these students. The treatment and control group means differed by about a tenth of a standard deviation. Students who dropped out of both groups were similar. The standard deviation can be used to assess the magnitude of the estimated effect. In this population, the data in Table 5.4.1 indicate an estimated effect of 2.86 units which is about a third of a standard deviation on the posttest.

Table 5.2.1

Pretest and Posttest Summary Data: Fall 1975
Accounting 101, College I

	N	Sum	Sum-Squared	Mean	VAR (N)	SD (N)	SD (N-1)	Low	High
All PLATO Classes									
Pre only	10	230.00	5440.00	23.00	15.00	3.87	4.08	17.00	32.00
Pre & Pos	13	308.00	7642.00	23.69	26.52	5.15	5.36	13.00	32.00
Pos & Pre	13	354.00	10562.00	27.23	70.95	8.42	8.77	11.00	42.00
Pos only	3	63.00	1709.00	21.00	128.67	11.34	13.89	12.00	37.00
All Non-PLATO Classes									
Pre only	5	118.00	2840.00	23.60	11.04	3.32	3.71	19.00	29.00
Pre & Pos	25	578.00	14030.00	23.12	26.67	5.16	5.27	14.00	33.00
Pos & Pre	25	596.00	15630.00	23.84	56.85	7.54	7.70	9.00	35.00
Pos only	3	51.00	939.00	17.00	24.00	4.90	6.00	11.00	23.00
All Classes									
Pre only	15	348.00	8280.00	23.20	13.76	3.71	3.84	17.00	32.00
Pre & Pos	38	886.00	21672.00	23.32	26.69	5.17	5.24	13.00	33.00
Pos & Pre	38	950.00	26192.00	25.00	64.26	8.02	8.12	9.00	42.00
Pos only	6	114.00	2648.00	19.00	80.33	8.96	9.82	11.00	37.00

The summary statistics for the other 31 populations (Tables 5.2.1a-5.2.1j in the appendix) are similar. The registration procedure in the colleges resulted in the placement of similar students in the treatment and control conditions within courses in the evaluation.

5.3 Analysis of the data

To summarize the analysis strategy, the dependent variable (posttest score) was regressed on the independent variables--pretest scores, a PLATO indicator variable, instructor and college variables when appropriate, squares of pretest scores to check for non-linearity, and products of independent variables to check for interactions and non-parallelism. For each analysis, the treatment effect (τ), a measure of the significance of the treatment effect (t - statistic), and a measure of the predictive power of the model (R^2 - multiple correlation squared), are reported. If the regression indicated the need for a more complicated model, the necessary adjustment was made and the adjusted τ and R^2 computed. In general, fitting a more complicated model increased the predictive power but changed the estimated treatment effect only slightly.

Before presenting the summary of estimated treatment effects for the populations in the study, one application of the analysis strategy will be presented in detail to illustrate the method.

In Accounting 101 at College III, seven classes participated in the evaluation, four were treatment classes and three were control classes. One instructor (C1) taught both a PLATO and a non-PLATO class. One instructor (C2) taught three PLATO classes. Two instructors (C3 and C4) taught non-PLATO classes. Data were collected on 148 students. Within each of the two conditions, treatment and control, a student can be identified by a three component vector (Y_i, X_i, C_i) where

Y_i = posttest score

X_i = pretest score

$$C_i = \begin{cases} 1 \text{ if the student is taught by instructor } C_1 \\ 0 \text{ if the student is not taught by instructor } C_1 , \end{cases}$$

In the entire population, a student can be identified by a four component vector (Y_i, X_i, C_i, PLATO) where

$$\text{PLATO} = \begin{cases} 1 \text{ if student } i \text{ is in a PLATO class} \\ 0 \text{ if student } i \text{ is in a non-PLATO class} . \end{cases}$$

A response function of the form

$$Y = b_0 + b_1 (X) + b_2 (C) + b_3 (\text{PLATO})$$

is fit to these data by regressing Y on X, C, and PLATO. In order to check for non-linearity, X^2 (pretest squared) is introduced into the regression to determine whether it significantly increases the predictive power of the model. In addition, non-parallelism is checked by introducing the interaction terms "PLATO x pretest" and "PLATO x instructor" into the regression. If any of these terms appear to significantly increase the predictive power ($t \geq 2.00$) of the model, they are introduced into the regression and separate response functions are determined. The results of the analysis, shown in Table 5.3.1, indicate that

$$Y = -6.70 + 1.30\ X + 2.22\ \text{PLATO} + 1.05\ C$$

provides a reasonable fit to the observed data. For students in the PLATO group,

$$Y = -6.70 + 1.30\ X + 1.05\ C + 2.22;$$

for students in the non-PLATO group

$$Y = -6.70 + 1.30\ X + 1.05\ C,$$

and the coefficient of the PLATO term is the estimated PLATO effect ($\tau = 2.22$). This means that students in the PLATO group scored about two items higher than students in the non-PLATO group on this 54 item posttest.

5.4 Results of the analyses

In order to interpret the results of the analyses, it is necessary to understand the basic purpose of the evaluation design. We are trying to find evidence of the impact of the PLATO computer-based education system on student achievement by comparing students who use the system with students who do not use the system. In the ideal situation, the comparison would be based on a well controlled experiment in which all variables, except the variable of interest, in this case use of the

Table 5.3.1

Regression Analysis

Accounting 131 Pretest
Introductory Accounting (192)

The dependent variable is post, the multiple correlation is 0.6129, the standard error of estimate = 7.3046.

	Sum of Squares	Proportion of Squares	N.D.F.	Mean Square	F Ratio	Probability of Larger F
Total About Origin	187429.0000		148.			
Under Null Hypothesis	12305.4797	1.000	147.			
Due to Hypothesis	4622.0709	0.3756	3.	1540.6903	28.8751	0.0000
Error	7683.4089	0.6244	144.	53.3570		

	Standard Reg. Weight	Regression Weights	Standard Error of Wt.	T Statistics With 144.D.F.	Contribution To R-Sq.	Measure of Collinearity
Concomitant Variables						
Pseudo		-6.6973	4.8119	-1.3918		0.9844
Independent Variables						
Pre	0.6415	1.2982	0.1455	8.9200	-0.3450	0.1615
PLATO	0.1194	2.2174	1.3343	1.6618	-0.0120	0.1600
Instructor	0.0510	1.0547	1.3810	0.7638	-0.0025	0.0259
Other Variables				NOW 143.D.F.		
Pre-PLATO	-0.4461	-0.2791	0.2950	-0.9461	0.0039	0.9805
Pre-Instructor	0.1623	0.1054	0.3085	0.3415	0.0005	0.9807
PLATO Instructor	0.0721	1.9655	2.7627	0.7115	0.0022	0.5764
Pre 2	-0.1600	-0.0056	0.0235	-0.2362	0.0002	0.9905
Pre-PLATO Instr.	0.0550	0.0495	0.0908	0.5452	0.0013	0.5719

PLATO system, would be held constant. Such a well controlled study was neither desirable nor feasible in this evaluation. The freedom allowed to instructors in implementing the PLATO system resulted in considerable variation in content presented, mode of presentation, extent of usage, and a host of other variables. In addition, the nature of the instruction provided in the control or comparison classes was not controlled or even studied in detail. Given this situation, how can any results be interpretable? In a real-world evaluation, where extraneous variables cannot be controlled without doing considerable violence to the very context that is of interest, interpretable information can be gained by considering the variable of interest (in this case, use of the PLATO system) in a variety of situations in which other variables can be considered somewhat randomly distributed or, at least, balanced across the various situations.

In the design implemented in this evaluation, the effect of PLATO is estimated in a number of colleges, across a number of different subject areas, across a large number of instructors, and across the variety of ways in which instructors implemented the system.

Although it is true that any single estimated effect needs to be interpreted in view of the uncontrolled variables in that particular situation, the overall design provides a reasonable, and quite powerful, opportunity for detecting helpful or harmful effects because the only common difference between the treatment and control conditions across the many populations studied is use or non-use of the PLATO system. Therefore, the most interpretable result will be that based on the evaluation viewed as a whole.

Then, once the overall result is interpreted, it is reasonable to examine specific populations in which the results of the analysis indicate distinctive effects. However, the study of specific estimated effects must be carried out with other uncontrolled variables taken into consideration. The responsibility of the evaluators is not simply fulfilled by ignoring extraneous variables. Even in real-world experiments, it is possible to provide some control over extraneous variables in order to insure that information will be as interpretable as possible. Therefore, in this evaluation, an attempt was made to gain at least some control over instructor variables by requesting many instructors to teach both PLATO and non-PLATO sections of the same course. In the view of the evaluation staff, the instructor is the most important variable in the study of student achievement. When different instructors are present in the treatment and control conditions of an experiment, it is very difficult, if not impossible, to unconfound the effects due to instructors and the effects due to the treatment. Therefore, the opportunity provided in this evaluation design for validating effects with instructor effects controlled at least partially is considered an important strength of the design.

In the discussion of the results to follow, it will be shown that the overall effect of PLATO on student achievement is neither harmful nor helpful. In the technical sense, the overall results do not provide sufficient evidence for rejecting the null hypothesis of no difference in achievement between the PLATO and non-PLATO students. It is, of course, not possible to prove the null hypothesis. But, if the opportunity to produce results was a fair one, and if the assessment of results was valid, then this finding of no difference in the overall evaluation is conclusive within the context of the implementation and demonstration.

In the case of effects examined in specific populations, it is necessary to take into consideration extraneous variables and alternative plausible hypotheses in interpreting the results. When the effect in a specific population can be accounted for by instructor effects due to different instructors in the treatment and control conditions, we think that this alternative hypothesis must be accepted as the cause of the effect in the absence of further evidence of differences between the groups.

Based on this context for interpreting results, the data and analyses provide quite useful information. The overall results are presented in the next section followed by a discussion of effects in specific populations and interaction effects.

Overall results. In Table 5.4.1, the estimated PLATO effect on achievement is given for each population. In English, the same pretests and posttests were administered to all students. Preliminary analyses showed that the same mathematical model fit all of the subpopulations in English, and therefore students were pooled across colleges in estimating the parameters of the model. Thus the six English populations in the Fall 1975 semester have been combined into one, resulting in 14 populations of interest in the Fall 1975 semester. In the Spring 1976 semester, the five English populations have been combined thus giving nine populations of interest. The summary data in chemistry are averages over the topical tests given at intervals during the semester.

The effects given in Table 5.4.1 are estimated effects using the general model with the assumption that linear parallel response functions for the PLATO and non-PLATO groups provide a reasonable fit to the data. In other words, all of the data are used to estimate the parameters of the model without introducing non-linear and interaction terms into the model. In five specific populations, the introduction of such terms into the model improved the fit of the model to the data significantly with little or no impact on the estimated PLATO effect. These five instances are treated within the context of the treatment of results for specific populations.

Of the 23 estimated effects shown in Table 5.4.1, 11 were in the positive direction and 12 in the negative direction. The estimated effect size ranged from 0 to 3 1/2 units in both the positive and negative directions. The average number of items on the posttests was about 50 items, so we are not talking about substantial absolute effects in any case. Of the 23 estimates, five were significant at $p < .05$. Four of the significant effects were in the positive direction and one was in the negative direction. Of the five significant effects, two occurred in the first semester and three in the second semester. No significant effects were replicated in similar populations across semesters. Of the five significant effects, one was in a mathematics course, one in a chemistry course, and three in three different biology courses.

Table 5.4.1

Achievement Analysis

A. Fall 1975 Semester

Course	College	n	r	(t)	R^2
Accounting 101	I	38	2.86	(1.29)	.399
	II	27	-0.81	(-0.28)	.347
	III	148	2.22	(1.66)	.376
Biology 101	II	59	-1.12	(-0.58)	.303
Biology 102	III	135	-1.82	(-1.82)	.537
Biology 111	I	207	-1.61	(-1.57)	.197
Biology 112	I	90	1.06	(0.97)	.265
Chemistry 101	IV	101	0.01	(-0.21)	.378
Chemistry 121	I	42	-1.29	(-0.75)	.230
	II	59	-1.56	(-0.93)	.198
	III	68	2.50	(2.23)*	.274
Chemistry 201	II	54	1.84	(1.19)	.321
English 100/101	All	475	0.67	(1.42)	.660
Mathematics 111	I	50	3.91	(3.11)*	.609
B. Spring 1976 Semester					
Accounting 101	I	16	-3.25	(-1.15)	.396
	III	90	-1.04	(-0.57)	.337
Biology 102	II	40	0.79	(0.32)	.199
	III	43	-3.49	(-2.49)*	.600
Biology 111	I	104	3.34	(3.03)*	.320
Biology 112	I	80	3.25	(2.84)*	.351
Chemistry 121	II	43	-0.81	(-0.81)	.214
English 100/101	All	209	-1.20	(-1.70)	.637
Mathematics 111	I	53	-2.13	(-1.79)	.487

* Significant at $p < .05$.

Because five significant effects are more than one would expect by chance, these five effects in specific populations are considered in greater detail in the next section. However, based on the overall results, there was no evidence of a positive or negative impact of PLATO on student achievement across subject areas.

Results in specific populations. It is not unreasonable to consider the hypothesis that PLATO had a significant impact in some cases even though the overall evaluation shows no consistent impact across subject areas and colleges. Perhaps, in some of the populations, the particular mode of implementation may have been more appropriate than in other populations. There is evidence to show that in four of the five cases where significant differences between the PLATO and non-PLATO groups were found, the effects can be accounted for by the alternative plausible hypothesis of the effects being due to different instructors in the treatment and control conditions.

In two cases, the yoked nature of the design provides the opportunity for validating the estimated effect on identical instructors across the two conditions. It was shown in each of these cases that the estimated effect was decreased and no longer significant when the analyses were performed using identical instructors only. In two additional cases, there were no identical instructors across the conditions, and the treatment effect and the effect due to different instructors are totally confounded. Therefore, it is not possible to provide a definitive interpretation of the results. In the fifth case, there was only one participating instructor who taught both the PLATO and non-PLATO students. Therefore, the extraneous variable of instructor effects was controlled for. This fifth case was examined more closely for other plausible explanations of the effect estimated.

In Table 5.4.1, it can be seen that there was a significant difference between the PLATO and non-PLATO students in Chemistry 121 at College III. The basic design (Table 3.1.1) shows that there were two participating instructors (U1 and U2) in this population. Instructor U1 was identical across the treatment and control conditions, and Instructor U2 taught only PLATO students. When the data were analyzed for Instructor U1 alone, the estimated effect (τ) was 1.84 with a t-value of 1.38. This estimate was not significant, though it was in the same direction, and does not effect the interpretation of the overall results. Therefore, the original, larger estimate of 2.50 can be plausibly explained as the additional effect due to Instructor U2 who taught only in the PLATO condition.

In Mathematics 111 at College I, there were three participating instructors (01, 02, and 03). Only Instructor 01 taught both PLATO and non-PLATO students; therefore it is impossible to distinguish the impact of the treatment from the differential impacts of Instructors 02 and 03. However, it is possible to validate the effect using Instructor 01 only which provides some control over instructor variables. When the data were analyzed for Instructor 01 alone, the estimated effect was 1.97 with a corresponding t-value of 1.32. The original, larger estimate can be plausibly explained as the additional effect due to the different impacts of Instructors 02 and 03.

Therefore, in these two specific populations, we were not able to implement a design completely balanced across instructor variables. Significant differences were found between the PLATO and non-PLATO students, but these differences were no longer significant when the instructor variable was controlled. In the light of the many non-significant differences found in the overall evaluation, it seems plausible to account for the significant effects in terms of differing instructor effects rather than a treatment effect.

In the Spring 1976 semester, there were three significant effects, two positive and one negative. These correspond to populations D, E, and G in Table 3.1.2. In populations D and E, instructors were completely different in the two conditions. In population G, there was only one participating instructor across the treatment and control conditions. Therefore it is not possible to use the yoked nature of the design to validate the estimated effects in these cases. However, it is possible to shed further light on these results.

Population D corresponds to Biology 111 at College I. There were three instructors (D5, D6, and D8) in the treatment condition and two (D7 and D9) in the control condition. This course included a laboratory component, and instructors generally did not teach more than one section of the course. As a result, it was difficult to obtain identical instructors across the two conditions. However, in the Fall semester, one instructor did teach both PLATO and non-Plato students. With this teacher matched across the two conditions, and a larger group of participating instructors, a small negative difference between PLATO and non-PLATO students was found. In the light of this result, and in view of the overall effects, it is plausible that the differences in the Spring were due to instructor differences rather than to PLATO.

In Biology 112 at College I (population E), a second level laboratory course, instructor variables and treatment are again totally confounded, and the result is not conclusive. In a similar population in the Fall 1975 semester, with different PLATO instructors but the same non-PLATO instructor, the effect was smaller but still positive. In light of the overall evaluation, it seems reasonable to attribute this effect to instructor differences rather than to PLATO.

Finally, a significant negative difference between PLATO and non-PLATO students was found in Biology 102 in College III in the Spring semester. In this case, the treatment is not confounded with instructor variables. One instructor (G1) taught all students. Therefore, all other things being equal, this effect can be attributed to the treatment. However, all other things were not equal. This instructor was one of the more experienced PLATO users and had developed a number of biology lessons on the system. The evaluators worked closely with this instructor in implementing the evaluation design and in fashioning the posttest for that course. This instructor informed the evaluators that the PLATO students tended to fall behind the non-PLATO students in completing the work of the course. As a result, this instructor did not use the posttest significantly in determining student grades. Notice in Table 5.1.1, that the validity coefficients using grades as criteria were only

.28 and .24 in the Biology 102 course at College III, the lowest in the entire evaluation. This is not to say that the posttests were not valid. They were content valid based on the curriculum for the course. However, it is likely that PLATO students did not cover all of the material included in the posttest. Whether this was due to the PLATO materials, student attendance, instructor direction, or some other variable, we do not know. It was not possible to control all variables except exposure to the medium across the treatment and control conditions in this evaluation. However, this one significant negative result occurred in only one of 32 populations studied and should be interpreted within that context.

To summarize, there were significant findings in five specific populations. Two of these were reduced in magnitude and significance when instructor variables were controlled. Two others, both in the positive direction, were totally confounded with instructor variables. In light of the overall findings, it seemed plausible to attribute these effects to instructor differences. One negative effect could not be accounted for in terms of instructor differences. It is likely that this estimate reflected a real difference between the PLATO and non-PLATO students in that population. It was possible to explain this difference in terms of less course material being completed by the PLATO students. In view of these findings, and the large number of non-significant findings in the overall evaluation, there is no compelling evidence that PLATO was helpful or harmful to student achievement.

Interaction effects. In developing the summary data given in Table 5.4.1, literally hundreds of analyses were performed to verify the fit of the general mathematical model to the data in each population. Scatter plots for all classes and the residuals for all students were examined to insure that the data could be aggregated for all students and classes in each population. In general, a simplified model fit the data well in all cases. However, there were five instances, one in accounting and four in biology, when the analyses indicated that a more complicated mathematical model did provide a significantly better fit to the data. These five instances are considered in greater detail in this section.

Revising the model by adding interaction and non-linear terms into the regression did not increase the power of the model substantially. Furthermore, the introduction of non-linear terms did not effect the basic concept of parallel response functions which justified the use of average effects in the summary data. In the case of interaction effects, there was a concern that the summary effect (averaged across initial ability levels) may have masked interesting effects at different levels of initial ability.

In the five cases referred to above, two (Biology 102 at College III in the Fall 1975 semester and Biology 112 at College I in the Spring 1976 semester) involved the introduction of pretest-squared terms into the general mathematical model. The power of the fit (R^2) was increased from .537 to .552 and from .351 to .412 respectively. In both cases, there was a negligible impact on the estimated PLATO effect. In the Biology 102 population, the PLATO effect was increased from -1.82 to -1.80 with no change in the significance of the effect. In Biology 112, the estimated PLATO effect was decreased from 3.25 to 3.12 with no change in the significance of the PLATO effect.

There were three cases in which the analyses indicated a significant aptitude x treatment interaction (Accounting 101 at College III in the Spring 1976 semester, Biology 102 at College II in the Spring 1976 semester, and Biology 102 at College III in the Spring 1976 semester). None of these interactions was replicated across semesters. Therefore, there was no strong evidence for differential PLATO effects on students with differing initial abilities. However, because there is considerable interest in knowing as much as possible about the impact of the PLATO system, and because even some evidence might be helpful in making policy decisions about future applications of the PLATO system to students at differing levels of ability, these three cases are presented in some detail. However, the evaluators are concerned that this evidence be interpreted within the context of the overall evaluation.

The three interaction terms indicated as significant in the analyses were all in the positive direction. This means that the slope of the response function for PLATO students was more positive than that of the response function for non-PLATO students. The general response function for each of the three populations is given by the following equation:

$$u\ (X) = b_o + b_1\ (\mathrm{PRE}) + e\ .$$

The response functions for the treatment and control groups are:

$$u_T\ (X) = b_o + b_1\ (\mathrm{PRE}) + b_2\ (\mathrm{PLATO}) + b_3\ (\mathrm{PRE\ x\ PLATO})$$

$$u_C\ (X) = b_o + b_1\ (\mathrm{PRE}).$$

In the case of no interaction term, the estimated PLATO effect

$$\hat{\tau} = \frac{1}{n} \sum_i (\hat{u}_T\ (X_i) - \hat{u}_c\ (X_i))$$

is simply $\hat{e}$ and is given directly from the regression analysis as b_2, the coefficient of the PLATO term. When the more complicated model with the interaction term is used, the estimated PLATO effect is itself a function of the pretest. However, the best estimate of the PLATO effect is still the difference between the response functions averaged over all values of X. When this was done, the estimated PLATO effects were virtually unchanged. The power of the model was increased significantly but not substantially. In accounting, R^2 was increased from .337 to .396; in Biology 102 at College II, R^2 was increased from .199 to .282; and, in Biology 102 at College III, R^2 was increased from .600 to .660. However, the question about whether this summary statistic, the average PLATO effect, adequately captures all of the information in the data has not yet been answered. In order to provide information on this question, each analysis is presented separately.

In Accounting 101, the best fit to the data was given by the following equation:

$$Y = 19.1890 + .5411\ (\mathrm{PRE}) - 32.3042\ (\mathrm{PLATO}) + 1.1201\ (\mathrm{PRE\ x\ PLATO}).$$

Therefore, the response functions in the two conditions do not have equal slopes and the estimate of τ is a function of the pretest:

$$\tau = -32.3042 + 1.1201\ (\mathrm{PRE}).$$

The average PLATO effect using the more complicated mathematical model was decreased slightly from -1.04 to -1.07. In order to assess the adequacy of this summary statistic, effects at -2, -1, 1, and 2 standard deviations from the mean initial abilities have been estimated. These estimates were -22.1, -6.18, 4.05, 9.16. It is clear from these estimated effects, and from the difference in the slopes of the given equations, that the average effect given by the general model is an oversimplification of the information contained in the data for this population. Therefore, although it is fair to say that PLATO had no effect on the average student in this population, there is evidence of a negative effect on lower ability students and a positive effect on higher ability students.

In Biology 102 at College II, the estimate of τ is given by

$$\tau = -14.1441 + 1.0093 \text{ (PRE)}.$$

The estimated average PLATO effect was decreased slightly from .79 to .77 using the full model. However, it is clear from the equation given above that the summary effect does not fully exhaust the information in the data. Estimated effects at -2, -1, 1, and 2 standard deviations from the mean pretest score were -8.53, -3.88, 5.42, and 10.07 respectively. There is some evidence in this population of a negative effect on lower ability students and a positive effect on higher ability students.

In Biology 102 at College III, the estimate of τ is given by the following equation:

$$\tau = -13.7503 + .7449 \text{ (PRE)}.$$

The average PLATO effect was increased from -3.49 to -2.65 by the application of the full model to the data. Estimates of the PLATO effect at -2, -1, 1, and 2 standard deviations from the mean pretest score were -10.48, -6.56, 1.27, and 5.18. Therefore, in this population, there was evidence that PLATO had a negative effect on lower ability students and a positive effect on higher ability students. The average effect did not provide an adequate summary of the information in the data.

To summarize this information, significant interaction effects occurred in three of 32 populations studied. In each case, a similar population had been examined in the preceding semester. The interaction effects were not replicated across semesters. However, in each of the three cases, the aptitude-treatment interaction was positive. Therefore, if PLATO does tend to have a different effect on students at different ability levels, these three cases indicate a more favorable effect on higher ability students than lower ability students.

We can provide more information on this hypothesis by examining all of the aptitude x treatment terms in the analyses. These terms were introduced into the final model if the preliminary analyses indicated a significant effect on the model. In the course of the analyses, several dozen such terms were examined. In accounting and biology, there was simply one pretest score for each student. In English, both objective and essay pretest scores were examined. In chemistry, a mathematics score and an aptitude score for chemistry were examined. And, in mathematics, pretest scores in arithmetic skills and algebraic skills were examined separately. Furthermore, in chemistry, some 25 separate topical tests were used as dependent variables. Interaction terms were examined for significant effects for each dependent variable. On the whole, across all subjects, colleges, and semesters, approximately 73 interaction terms were examined. Of these, 52 were in chemistry and 21 were in the other four subject areas. Of the 52 examined in chemistry, 24 were in the positive direction and 28 were in the negative direction. Within each course, almost exactly half were in the positive direction and half were in the negative direction, so the overall summary is representative of the results in every course. Of the remaining 21 terms examined, nine were in the positive direction and 12 in the negative direction. These were well spread across subject areas with three positive and two negative in accounting, four positive and four negative in biology, two positive and two negative in English, and four negative, but very close to zero (-.07, -.09, -.08, and -.17), in mathematics. Of the 73 terms examined, only three were significant and were the basis for the preceding discussion.

This further discussion of interaction effects tends to put the preceding discussion of a positive interaction in context. In the overall analysis, there is little evidence of a significant aptitude x treatment interaction. What little evidence does exist is in the positive direction with PLATO exhibiting a tendency to be more effective for high ability than low ability students in the areas of accounting and biology.

5.5 Summary

Based on curriculum outlines in each targeted course, pretests and posttests were developed for assessing achievement and initial aptitude in each population in the evaluation. Substantial instructor input into the construction of the tests was generated to insure content validity. A form of criterion validity was determined using student grades. Some instructors agreed to teach both PLATO and non-PLATO sections of courses to provide some control over instructor variables and a partially balanced evaluation design. The designs given in Tables 3.1.1 and 3.1.2 were implemented and provided the basic data for the analysis of achievement effects.

In the overall evaluation, most of the estimated effects were non-significant with about half in the positive direction and half in the negative direction. There were some significant effects in specific populations, but these could generally be explained in terms of the effects of different instructors in the treatment and control conditions. In one case, a negative treatment effect could not be so explained and seemed rather to be due to the PLATO students proceeding more slowly in their course work than the non-PLATO students.

An examination of interaction effects indicated few instances in which the summary effect was not an adequate indication of the estimated effects across the full range of initial abilities. In these few instances, the tendency was for the PLATO effect to be generally negative for lower ability students and positive for higher ability students.

The results, taken together and in perspective, provide no compelling statistical evidence that PLATO had either a positive or negative effect on student achievement.

Chapter 6

Student and Instructor Attitudes

The impact of the PLATO system on student and instructor attitudes was evaluated using data obtained from student and instructor questionnaires. Copies of the six questionnaires used are included in the appendix. The large numbers of responses given by both instructors and students to the few open-ended questions indicate that the questionnaires were seriously completed. Items in the student questionnaires were balanced in positive and negative directions to minimize response set biases.

6.1 Description of the data

Students. In the Fall 1975 semester, 2,194 students responded to a pre-treatment questionnaire and 1,369 responded to a post-treatment questionnaire. The corresponding figures for the Spring 1976 semester were 1,558 and 986. The distributions of responses across the participating colleges and targeted subject areas are given in Table 6.1.1 for both semesters. In the Fall 1975 semester, College V did not participate in the survey of student attitudes. In the Spring 1976 semester, post surveys were administered in College V but it was not possible to identify non-PLATO classes as comparison groups. The unique nature of College V has been explained previously.

Not all instructors agreed to allow their students to complete the final questionnaires. In addition, some students in some classes did not complete the questionnaires. Some instructors agreed to the collection of questionnaire data but not achievement data. Based on those classes in which students were both post-tested and post-surveyed, the response rate was approximately 90% in both the Fall and Spring semesters.

Table 6.1.1

Student Attitude Surveys
Fall 1975

College	Pre		Total Pre	Post		Total Post
	P	NP		P	NP	
I	605	305	910	352	274	626
II	168	153	321	172	136	308
III	333	380	713	250	183	433
IV	135	115	250	105	86	191
Totals	1241	953	2194	879	679	1558
Subject						
Accounting	35	89	124	86	66	152
Biology	452	248	700	294	144	438
Chemistry	297	232	529	213	145	358
English	413	362	775	264	313	577
Mathematics	44	22	66	22	11	33
Totals	1241	953	2194	879	679	1558

Spring 1976

College	Pre P	Pre NP	Total Pre	Post P	Post NP	Total Post
I	415	280	695	252	160	412
II	67	101	168	107	67	174
III	190	218	408	118	80	198
IV	93	5	98	39	-	39
V	-	-	-	163	-	163
Totals	765	604	1369	679	307	986
Subject						
Accounting	85	94	179	47	50	97
Biology	210	169	379	146	101	247
Chemistry	160	23	183	140	15	155
English	255	264	519	223	124	347
Mathematics	55	54	109	123	17	140
Totals	765	604	1369	679	307	986

P=PLATO

NP=non-PLATO

Instructors. Instructor questionnaires were administered shortly after the end of the Fall 1975 semester to all instructors who participated in the evaluation and to additional PLATO instructors listed on the college PLATO laboratory schedules. The questionnaires were administered by mail, and instructors were informed that their responses would be kept strictly confidential by the independent evaluators. Three distinct questionnaires were distributed, one (#014) to those instructors who had served as their own controls in the evaluation, one (#015) to all PLATO instructors, and one (#016) to the non-PLATO instructors who had participated in the evaluation. The response rates to these questionnaires were approximately 88%, 80%, and 93% respectively.

The general PLATO questionnaire (#015) was five pages long and included approximately 40 questions about the PLATO computer-based education system. The additional two questionnaires (#014 and #016) were brief and were intended to provide additional information about the perceptions of instructors with both PLATO and non-PLATO students and the "spill-over" effects of PLATO on non-PLATO instructors. The sample sizes (28 and 14) for the latter two questionnaires were considered too small for sub-analyses at the college and subject area levels. Only total responses are reported. The responses of instructors to the general PLATO questionnaire were analyzed at the college and subject area levels. The distributions by college and subject area for the 88 PLATO instructors who responded are given in Table 6.1.2.

Table 6.1.2

PLATO Faculty Questionnaires

	Colleges					
Subject Area	I	II	III	IV	V	Totals
Accounting	1	1	3	2	2	9
Biology	7	2	6			15
Chemistry	3	6	4	3		16
English	9	4	4	10	4	31
Mathematics	7				4	11
Other	1		5			6
Total	28	13	22	15	10	88

6.2 Comparison of PLATO and non-PLATO students

Initial attitudes. Because the evaluators intended to compare attitudes of PLATO and non-PLATO students at the end of the semester, it was necessary to verify the similarity of treatment and control groups prior to the start of the treatment. As previously explained in the chapters on attrition and achievement, students were not placed randomly. However, we expected the registration process and the fact that many known PLATO instructors would in fact not use PLATO in some of their classes to result in similar students in the treatment and control conditions. To verify this, an initial survey of student attitudes toward computers in general and toward computer-assisted instruction was administered to 2,194 students at the beginning of the Fall 1975 semester. The results of this preliminary survey, given in Table 6.2.1, indicated considerable differences in the initial attitudes of PLATO and non-PLATO students. On all eight questions, PLATO students showed more favorable attitudes which was rather strong evidence for a self-selection bias in the evaluation. Because these empirical results were unexpected and troubling, instructors were interviewed to make sure that the data were valid. In these interviews, the evaluators discovered that many instructors had informed their students whether they would or would not use PLATO before the students completed the questionnaire. If it can be assumed that the treatment and control students did not differ before entering their respective classes (the results of the Spring semester survey provide strong evidence for this assertion), then the results in Table 6.2.1 show that student attitudes were significantly altered by instructor information very early on in the semester. There are explanations for this phenomenon (conformity behavior and cognitive dissonance, for example), but the results should caution the evaluator (experimenter) in explaining attitude differences and attitude change.

As a result of the information gained in the Fall 1975 semester, the evaluators worked very closely with the participating instructors in the Spring 1976 semester to insure that nothing be said about computers or computer-assisted instruction until the students had completed the

Table 6.2.1

Initial Attitudes of Students
Fall 1975 Semester

		PLATO		Non-PLATO		
		Freq.	Percent	Freq.	Percent	Chi-square
1. Do you think a computer would help fit your instruction to your needs?						55.44
	Yes	634	51.1	359	37.7	
	No	122	9.8	179	18.8	
	Not Sure	480	38.7	410	43.0	
	No Response	5	0.4	5	0.5	
2. Do you think computer-assisted instruction would make you actively involved in your own learning?						48.85
	Yes	798	64.3	495	51.9	
	No	131	10.6	191	20.0	
	Not Sure	302	24.3	260	27.3	
	No Response	10	0.8	7	0.7	
3. Do you think that computers are too impersonal for student instruction?						34.32
	Yes	247	19.9	288	30.2	
	No	705	56.8	444	46.6	
	Not Sure	278	22.4	210	22.0	
	No Response	11	0.9	11	1.2	
4. Do you think that the mechanics of using a computer terminal could distract you from learning?						26.13
	Yes	134	10.8	171	17.9	
	No	824	66.4	553	58.0	
	Not Sure	271	21.8	219	23.0	
	No Response	12	1.0	10	1.1	
5. Do you think computer-assisted instruction would allow you to set a pace that is right for your ability level?						12.25
	Yes	737	59.4	498	52.3	
	No	124	10.0	128	13.4	
	Not Sure	371	29.9	316	33.2	
	No Response	9	0.7	11	1.2	
6. Do you think you would feel comfortable working with computers?						38.39
	Yes	821	66.2	506	53.1	
	No	129	10.4	154	16.2	
	Not Sure	281	22.6	279	29.3	
	No Response	10	0.8	14	1.5	
7. Do you think that computers ought to become more important in the everyday life of our society?						3.81
	Yes	423	34.1	303	31.8	
	No	385	31.0	331	34.7	
	Not Sure	423	34.1	305	32.0	
	No Response	10	0.8	14	1.5	
8. Do you think computer-assisted instruction would allow students to assume greater responsibility for their own learning?						5.66
	Yes	709	57.1	501	52.6	
	No	174	14.0	164	17.2	
	Not Sure	352	28.4	277	29.1	
	No Response	6	0.5	11	1.2	

initial questionnaires. It was not possible to simply administer all questionnaires in the first few minutes of each class. There was considerable shifting of schedules during the first few days of classes in the community colleges in some courses. We wanted to minimize shifting based on PLATO as much as possible. Therefore, we were guided by teacher judgments in determining the best point at which to administer the initial questionnaires. The Spring data (Table 6.2.2) resulted in much smaller differences, although the PLATO students still showed significantly more favorable responses. A detailed examination of the data at the class level showed that students of known PLATO instructors not balanced in the evaluation design showed more favorable responses than the general population. Thus, it was not possible to verify no differences between the treatment and control groups in this component of the evaluation. However, it has been shown that initial differences were much smaller than had been suggested in the Fall data. This was sufficient to permit quite reasonable interpretations of the post treatment data as will be shown.

Before continuing, it should be explained that the chi-square (χ^2) values given in Tables 6.2.1 and 6.2.2 and other tables in this chapter can be used to assess the significance of the differences between PLATO and non-PLATO responses. The responses to each item correspond to the entries of a 2 x 2 contingency table:

	PLATO	non-PLATO	Total
Agree	a_1	a_2	N_A
Disagree	b_1	b_2	N_B
Total	N_1	N_2	N

where $\chi^2 = \frac{N(a_1b_2 - a_2b_1)^2}{N_1N_2N_AN_B}$.

For one degree of freedom, the significance values of χ^2 at the .05 and .01 levels are 3.84 and 6.63 respectively. Thus, whereas six of the differences in Table 6.2.1 are significant at the .01 level, only two are significant at the same level in Table 6.2.2.

Table 6.2.2

Initial Attitudes of Students
Spring 1976 Semester

		PLATO		Non-PLATO		
		Freq.	Percent	Freq.	Percent	Chi-square
1. Do you think a computer would help fit your instruction to your needs?						7.66
	Yes	346	45.2	235	38.1	
	No	94	12.3	99	16.4	
	Not Sure	321	42.0	268	44.4	
	No Response	4	0.5	2	0.3	
2. Do you think computer-assisted instruction would make you actively involved in your own learning?						3.77
	Yes	440	57.5	332	55.0	
	No	114	14.9	113	18.7	
	Not Sure	208	27.2	153	25.3	
	No Response	3	0.4	6	1.0	
3. Do you think that computers are too impersonal for student instruction?						5.12
	Yes	175	22.9	160	26.5	
	No	398	52.0	277	45.9	
	Not Sure	185	24.2	160	26.5	
	No Response	7	0.9	7	1.2	
4. Do you think that the mechanics of using a computer terminal could distract you from learning?						2.51
	Yes	112	14.6	100	16.6	
	No	495	64.7	365	60.4	
	Not Sure	157	20.5	137	22.7	
	No Response	1	0.1	2	0.3	
5. Do you think computer-assisted instruction would allow you to set a pace that is right for your ability level?						5.52
	Yes	406	53.1	304	50.3	
	No	99	12.9	106	17.6	
	Not Sure	255	33.3	192	31.8	
	No Response	5	0.7	2	0.3	
6. Do you think you would feel comfortable working with computers?						11.33
	Yes	498	65.1	343	56.8	
	No	93	12.2	79	13.1	
	Not Sure	171	22.4	180	29.8	
	No Response	3	0.4	2	0.3	
7. Do you think that computers ought to become more important in the everyday life of our society?						5.09
	Yes	301	39.4	202	33.4	
	No	244	31.9	211	34.9	
	Not Sure	216	28.2	188	31.1	
	No Response	4	0.5	3	0.5	
8. Do you think computer-assisted instruction would allow students to assume greater responsibility for their own learning?						3.46
	Yes	428	56.0	307	50.8	
	No	120	15.7	111	18.4	
	Not Sure	213	27.8	179	29.6	
	No Response	4	0.5	7	1.2	

Final attitudes. At the end of the Fall 1975 and Spring 1976 semesters, questionnaires were again administered to the PLATO and non-PLATO students. There were 25 common items on the two questionnaires. A factor analysis of the student data showed that the items related to computers and computer-assisted instruction (items 11-21) loaded on a common factor. However, the remaining 14 items did not show any simple structure. Although the computer-related factor accounted for 27% of the variance in the data, nine more factors were needed to account for an additional 50% of the data. Therefore, the formation of scale scores was not justified by the data. Results are presented and interpreted at the item level.

In Table 6.2.3., summaries of student responses for 879 PLATO students and 679 non-PLATO students are given for the Fall 1975 semester. Summaries by college and subject area are given in Tables 6.2.3a and 6.2.3b in the appendix. Summaries for the Spring 1976 semester are given in Tables 6.2.3c, 6.2.3d, and 6.2.3e in the appendix. In Table 6.2.3c, responses are given for Colleges I, II, and III only because there were no non-PLATO classes in Colleges IV and V in the Spring semester. The summary results given in Table 6.2.3 in the text are representative and will be used to illustrate effects verified in the evaluation. When results by college or subject area, or the results in the Spring semester, are informative, they will be given in the body of the report.

Each item was presented to the students in a forced-choice type format. Our intention was to encourage students to express their opinions and to prevent "don't know" or "not sure" responses. The response rates given as "Totals" in Table 6.2.3 show that this strategy worked well. At least 92% of the students responded to any given item. However, it should be noted that the responses to the alternatives are based on those students who responded to the item, and therefore the response rates add up to 100%.

Table 6.2.3

Responses of PLATO and non-PLATO Students
Fall 1975 Semester

		PLATO		Non-PLATO		
		Freq.	Percent	Freq.	Percent	Chi-square
1. In this course I felt challenged to do my best work.						0.04
	Agree	744	86.5	582	86.9	
	Disagree	116	13.5	88	13.1	
	Total	860	97.8	670	98.7	
2. There was real concern for my progress in this course.						2.79
	Agree	735	85.0	590	87.9	
	Disagree	130	15.0	81	12.1	
	Total	865	98.4	671	98.8	
3. I tried to just finish the assignments rather than learn in this course.						0.59
	Agree	114	13.1	79	11.8	
	Disagree	756	86.9	591	88.2	
	Total	870	99.0	670	98.7	
4. I did not receive any individual attention in this course.						0.23
	Agree	205	24.0	168	25.1	
	Disagree	649	76.0	502	74.9	
	Total	854	97.2	670	98.7	
5. In this course I often met with my instructor outside of class time.						0.02
	Agree	255	29.6	199	29.9	
	Disagree	606	70.4	466	70.1	
	Total	861	98.0	665	97.9	
6. In this course I felt free to ask questions or express my opinion.						0.41
	Agree	777	90.1	614	91.1	
	Disagree	85	9.9	60	8.9	
	Total	862	98.1	674	99.2	
7. I would not recommend this course to my friends.						1.46
	Agree	116	13.4	104	15.5	
	Disagree	753	86.7	566	84.5	
	Total	869	98.9	670	98.7	
8. Most of the work in this course was too hard.						5.41
	Agree	153	17.9	90	13.5	
	Disagree	702	62.1	577	86.5	
	Total	855	97.3	667	98.2	
9. In this course I often discussed the course material with other students.						0.13
	Agree	673	77.5	528	78.2	
	Disagree	196	22.6	147	21.8	
	Total	869	98.9	675	99.4	
10. In this course it was difficult to get help when I didn't understand the material.						3.32
	Agree	110	12.7	65	9.7	
	Disagree	759	87.3	606	90.3	
	Total	869	98.9	671	98.8	
11. Computers would help fit instruction to my needs.						123.58
	Agree	616	71.6	272	43.0	
	Disagree	244	28.4	360	57.0	
	Total	860	97.8	632	93.1	
12. Computers would make me actively involved in my own learning.						138.04
	Agree	658	76.5	299	47.0	
	Disagree	202	23.5	337	53.0	
	Total	860	97.8	636	93.7	
13. Computers are not good for instruction because they are always breaking down.						26.85
	Agree	163	18.9	193	30.5	
	Disagree	698	81.1	440	69.5	
	Total	861	98.0	633	93.2	

Table 6.2.3 (cont.)

		PLATO		Non-PLATO		
		Freq.	Percent	Freq.	Percent	Chi-square
14. Computers are too impersonal for student instruction.						96.25
	Agree	234	27.3	335	52.1	
	Disagree	624	72.7	308	47.9	
	Total	858	97.6	643	94.7	
15. Computer-assisted instruction would allow me to set a pace that is right for my ability.						51.15
	Agree	707	82.0	414	65.8	
	Disagree	155	18.0	215	34.2	
	Total	862	98.1	629	92.6	
16. Computers are nothing but baby-sitters for the teacher.						68.25
	Agree	98	11.4	179	28.2	
	Disagree	762	88.6	456	71.8	
	Total	860	97.8	635	93.5	
17. Computer-assisted instruction would allow students to assume greater responsibility for their own learning.						29.85
	Agree	739	85.2	474	74.0	
	Disagree	128	14.8	167	26.1	
	Total	867	98.6	641	94.4	
18. The mechanics of using a computer terminal would distract me from learning.						59.70
	Agree	116	13.5	191	29.7	
	Disagree	745	86.5	452	70.3	
	Total	861	98.0	643	94.7	
19. I would feel comfortable working with computers.						83.02
	Agree	675	79.1	367	57.3	
	Disagree	178	20.9	274	42.8	
	Total	853	97.0	641	94.4	
20. I would never choose a course that is taught using a computer.						19.97
	Agree	178	20.8	200	31.0	
	Disagree	676	79.2	446	69.0	
	Total	854	97.2	646	95.1	
21. Computers ought to become more important in the everyday life of our society.						7.58
	Agree	413	48.8	266	41.6	
	Disagree	433	51.2	373	58.4	
	Total	846	96.3	639	94.1	
22. I look forward to attending class in this course more than in other courses I took this semester.						3.93
	Agree	420	49.2	361	54.4	
	Disagree	433	50.8	303	45.6	
	Total	853	97.0	664	97.8	
23. Compared to other courses I've taken, this course was more challenging.						0.08
	Agree	572	66.7	438	66.1	
	Disagree	285	33.3	225	33.9	
	Total	857	97.5	663	97.6	
24. This course required more work than other courses I've taken.						0.04
	Agree	482	56.4	373	56.9	
	Disagree	373	43.6	283	43.1	
	Total	855	97.3	656	96.6	
25. For this course the number of hours per week I spent on homework outside of regularly scheduled class time was						12.78
	One	66	7.7	41	6.2	
	Two	112	13.1	66	10.0	
	Three	116	13.6	124	18.8	
	Four	165	19.3	140	21.3	
	Five	154	18.0	102	15.5	
	More than five	241	28.2	185	28.1	
	Total	854	97.2	658	96.9	

The results in items 11-21 show that, at the end of the semester PLATO students showed much more favorable attitudes toward computers and computer-assisted instruction than non-PLATO students. The differences are so great that they cannot be accounted for by the small initial differences present in the treatment and control groups. These differences undoubtedly reflect the impact of all of the components of the PLATO computer-based education system: hardware, instructors, courseware, site coordinators, laboratory aides, and so forth. The PLATO students were exposed to all of the components of the system, and since the results are replicated across the two semesters, the five participating colleges, and the five targeted subject areas, it seems difficult to consider a plausible hypothesis other than that the PLATO system had a highly significant impact on student attitudes in this area.

On the remaining 14 items, none of the differences were significant at the .01 level ($\chi^2 \geq 6.63$ for all items except #25; $\chi^2 \geq 15.1$ for item 25.) These results were replicated in the Spring data except for item 25. When College V was deleted from the Spring data (there were no non-PLATO students at College V), the difference in responses on item 25 was no longer significant at the .01 level. Therefore, these results indicate that PLATO had no significant effect on student attitudes as they were reflected in items 1-10 and 22-25 of this questionnaire.

The absence of highly significant differences in student attitudes does not mean that these data are useless and contain no information. On the contrary, many of the questions were asked precisely because they relate to the concerns that many people have about using computers to deliver instruction (for example, that students would be treated impersonally or become isolated from their instructors and from other students). These data show very clearly that such was not the case in this demonstration and implementation. On the contrary, equally large numbers of PLATO and non-PLATO students felt challenged to do their best work, thought that real concern was shown for their progress, thought that they received individual attention, felt free to ask questions and express opinions, often discussed their course material with other students, and did not find it difficult to get help when they didn't understand the material in their course. Admittedly, the evaluation results do not show a dramatic effect on student attitudes, but they do show that concerns often expressed seem unwarranted, at least based on this particular application of computer-based education.

Based on a less conservative interpretation, using a significance level of .05 ($\chi^2 \geq 11.1$ for item 25 and $\chi^2 \geq 3.84$ for other items), there are three significant differences shown in Table 6.2.3 (other than in items 11-21). In item 8, more PLATO than non-PLATO students considered the work in their course too hard. This difference was not replicated in the Spring semester. In item 22, more non-PLATO than PLATO students looked forward to their course more than to other courses taken during the semester. This difference was also not replicated in the Spring semester. In item 25, the distributions of time spent studying outside of regularly scheduled class time differed in the two populations. This difference was replicated in the Spring semester.

The effect of PLATO on student homework outside regular class time is not easy to interpret. If PLATO students simply spent less time on homework outside class time, we would expect the distribution for PLATO students to be skewed to the right. That does not appear to be the case. In both semesters, a greater proportion of the PLATO students than non-PLATO students spent fewer than three hours a week on homework outside class time. However, in both semesters, a greater proportion of PLATO students also spent more than four hours a week on homework outside class time. It may be that for students who tend to spend moderate amounts of time on homework, PLATO gives them an opportunity to get some of it done during their PLATO sessions. For students who tend to spend larger amounts of time on homework, perhaps PLATO provides them with more to do outside class time. This appears to be a plausible explanation for the data in item 25.

6.3 PLATO students

Students in the PLATO classes were asked to respond to 20 specific questions (items 26-45) about their PLATO experience. The items were presented in a forced-choice format. In Table 6.3.1. the percentages of positive and negative responses to each question are given. Summaries by college and subject area are given in Table 6.3.1a in the appendix. Corresponding results for the Spring 1976 semester are given in Tables 6.3.1b and 6.3.1c in the appendix. The summary results given in Table 6.3.1 are representative and will be used to describe the opinions and attitudes of the PLATO students. When results by college or subject area, or the results of the Spring semester analysis, are informative, they will be given in the body of the report.

Item 26 was administered to provide a rough idea of the amount of noise present in these data. In the comparative data presented for items 1-25 it could be assumed that noise was equally present in both PLATO and non-PLATO responses. Students might find a question ambiguous, might mark agree when they mean disagree, might be confused about the exact meaning of the responses, might read the question incorrectly, or might simply give random responses. We expected 100% of the PLATO students to agree with item 26. Approximately 96% did. The 4% (28 students) who disagreed with the statement were distributed across colleges and subject areas. It was clear that no entire class had completed the wrong questionnaire. However, it was not clear that the responses of these students were due to inattention or misunderstanding. Their responses to other questions indicated that they had used the PLATO system. A further check of the PLATO on-line-data showed that these students had used the system. Therefore, they were not deleted from the data, but the results of item 26 are simply noted as a caution in interpreting the data. In general, the questionnaires appear to have been completed seriously. Many students responded to the open end items on their likes and dislikes of the PLATO system.

Table 6.3.1

Responses of PLATO Students

Fall 1975 Semester

	% Agree	% Disagree
26. In this course, I used PLATO for part of my instruction.	96.3	3.7
27. The course material presented on PLATO helped me learn better than the course material presented in class lectures.	48.9	51.1
28. I would not want to have the whole course taught on PLATO.	82.7	17.3
29. Even though I could have left PLATO at the end of the class period, I often continued working for a few minutes.	71.3	28.7
30. Using PLATO is dehumanizing.	12.0	88.1
31. I would use PLATO more if the terminals were not being used so much.	60.2	39.8
32. When using PLATO, I prefer to share a terminal with another student rather than work by myself.	27.3	72.8
33. Using PLATO takes valuable time away from regular class time.	17.5	82.6
34. Using PLATO was of no help to me in this course.	11.0	89.0
35. Using PLATO is boring.	11.4	88.5
36. Too much time in this course was spent using PLATO.	8.1	91.9
37. In general, most PLATO lessons are too hard.	11.7	88.3
38. I like PLATO because a student can make mistakes without being embarrassed.	77.3	22.7
39. PLATO seemed to know when I didn't understand the material.	71.2	28.8
40. PLATO made helpful comments on my work.	78.9	21.1
41. PLATO did not give clear explanations of the material.	18.7	81.3
42. PLATO made good use of examples and illustrations.	90.2	9.8
43. I do not like PLATO because it will not let you go on until you show that you know a particular point.	27.7	72.3
44. I like PLATO because it lets students take part at each step in the lesson.	90.6	9.4
45. I would take another course that uses PLATO.	84.0	16.0

The students were divided about equally in agreeing or disagreeing that the PLATO course material helped them learn better than the lecture material (item 27). There was considerable variation in the responses to this item across colleges and subject areas. In two colleges, students were split about evenly. In a third college, 60% of the students agreed; and in a fourth college, 62% disagreed. In English, 63% of the respondents agreed with the statement, while in the other four subject areas percentages of students agreeing ranged from 40% to 46% In the Spring semester, the high percentage of agreement in English decreased to 47%. In College V, only included in the Spring semester, 71% of the students disagreed with this statement, and the overall percentage of agreement was reduced to 40%. It is not easy to summarize all of this information in a simple statement, but it is clear that no simple pattern was common across all courses and colleges.

The great majority (83%) of the students would not want their entire course to be taught on PLATO. This result was replicated across all colleges, all courses, and both semesters. It has strong implications for computer-assisted instruction, and especially for stand-alone programs. Based on the students in this evaluation, students do not want stand-alone computer-assisted instruction.

In item 29, the evaluators attempted to gain information about student motivation. We felt that if students continued working beyond the end of the regularly scheduled period, this would be an indication of good motivation. In the Fall 1975 semester, 71% of the students stated that they often continued working on PLATO beyond the end of the class period. This result was replicated in the Spring semester (69%) and was consistent across all colleges and subject areas with some variations. An independent measure of this variable was obtained in the observation study explained in the next chapter. Based on 100 PLATO laboratory observations, 28% of the students remained working at least five minutes beyond the end of the scheduled period. This information is consistent with students' "often" remaining beyond the end of the class period.

Items 30 and 35 were used to gain information about commonly expressed concerns that computer-assisted instruction will be dehumanizing and boring. In this particular implementation, that was not the case. In the Fall semester, 88% of the students disagreed with the statement that PLATO is dehumanizing, and 89% disagreed that using PLATO is boring. This result was replicated in the Spring semester (84% and 85%). These data also mean that roughly 10%-15% of the students did consider the use of PLATO dehumanizing and boring, strong evidence for its use being made more voluntary for students in the future.

Although our general conclusion, based on our observation of the PLATO system in operation, was that the numbers of terminals in the various colleges were adequate, the student responses to item 31 indicate that they would use PLATO more if terminals were more available (60%). Although this result was replicated in the Spring (57%), there was considerable variation (35%-70%) in responses across colleges and subject areas. The implication of this result is that the demand for more free terminals differs from situation to situation. We do not yet know, from this study, whether this demand could be met by keeping the community colleges open longer hours and on weekends to provide access to PLATO terminals. This is a possibility worth researching, but it was beyond the scope of this initial evaluation.

During the implementation and demonstration, sharing of terminals occurred fairly frequently when there were more students than terminals in the PLATO laboratory. When terminals were available, students were encouraged to use their own terminal so that individual student data could be collected. Also, one student per terminal seems more consistent with the concept of individualized instruction. Nevertheless, some feeling was expressed to the evaluators by instructors and developers that some students may in fact prefer to share a terminal with another student. Item 32 was used to gain information on this point. In the Fall semester, 27% of the students stated that they did prefer to share a terminal. This response rate was surprisingly consistent across semesters (29% in the Spring) and across colleges and subject areas.

This result may have implications for future implementations and for the amount and type of freedom to be given to the student in a more voluntary usage type of situation.

Items 33, 34, 36, and 37 present strong evidence that the students viewed their PLATO experience favorably, even in this implementation which was not voluntary at the student level. Substantial proportions of the students (83%-92%) disagreed that using PLATO takes valuable time away from regular class time, that using PLATO was of no help in the course, that too much time was spent in their course using PLATO, and that most PLATO lessons are too hard. These results were replicated almost exactly in the Spring semester and were consistent across all colleges and subject areas. These data also indicate that there were 8%-18% of the students who agreed with these statements and reinforce the conclusion that usage should move toward voluntary participation at the student level.

Items 38-44 were used to gain information about student perceptions of what are usually presented as the strengths of the PLATO system, namely that

a) students can make mistakes without being embarrassed,
b) students will receive immediate feedback to caution them when they don't understand something,
c) students will receive help when they need it,
d) PLATO will provide clear explanations of material,
e) PLATO will make good use of examples and illustrations,
f) students will have to show understanding before they can proceed, and
g) the system is interactive with students taking part at each step in the lessons.

Students generally perceived all of these components favorably (71%-91%). The interactive component and the use of examples and illustrations were viewed favorably by 91% and 90% of the students respectively. These results were replicated in the Spring semester with favorable responses ranging from 71% to 90%. These results were generally verified across all colleges with some small but consistent variations across the items.

For example, in the Fall semester, accounting and chemistry students were consistently more critical than the average student and English students were consistently more favorable. The results in English and accounting were replicated in the Spring semester, but the results in other subjects were less consistent. When students responded to the open end question about the things they liked about PLATO they virtually always mentioned the components in these items, No additional information was presented that was not anticipated in the questionnaire.

Finally, item 45 was used to provide information about student desire for further use of the PLATO system. The students might have been "turned off" by their PLATO experience. Faulty terminals due to red-lighting and overwriting were observed by the evaluators. We saw some students who were frustrated by signing off accidentally, by experiencing difficulty getting back to their appropriate place in a lesson, by PLATO's unwillingness to accept what appeared to them to be a reasonable and correct answer. The fact that these frustrations were not destructive is shown by the large percentage of students (84%) who stated that they would take another course that uses PLATO. This result was replicated in the Spring semester (82%) and was consistent across colleges and subject areas. This result also means that 16%-18% of the students did not want to take another course using PLATO, a further indication of the need for voluntary participation at the student level.

The strongest implication of these results appears to be that students were favorably impressed by their PLATO experience and that they would continue to use the system if the opportunity were provided. They seemed to like the system as it was implemented, that is, as integrated into the course rather than as a stand-alone instructional system. A small percentage (10%-15%) would prefer not to use the system.

6.4 Non-PLATO students

Students in the non-PLATO classes were asked to respond to ten questions (Table 6.4.1) about PLATO in order to gain some information about the effects of PLATO on non-PLATO students in the five targeted subject areas. Summaries by college and subject area are given in Table 6.4.1a in the appendix. Corresponding results for the Spring 1976 semester are given in Table 6.4.1b in the appendix. This is admittedly a biased sample of students. Some of them were in the non-PLATO classes. Some of them have used PLATO in other courses. We attempted to assess the bias and noise in the sample by using items 29, 33, 34, and 35.

The student responses to items 34 and 35 are troublesome in that instructors were asked not to allow their non-PLATO students to us the system in their courses. In addition, PLATO site personnel were asked and agreed to attempt to prevent the non-PLATO students in the evaluation from gaining access to the PLATO materials in their courses. In spite of these precautions, the results of this questionnaire indicate some contamination of our non-PLATO sample. In the PLATO sample, it should be recalled that 4% of the students responded that they did not use the system. We were able to show from independent data that they had in fact used the system. Their responses to other questions appeared meaningful and reasonable and we did not delete them from the data base. In general, we had expected some inconsistencies and have attempted to retain as much data as possible in order to avoid correcting for some inconsistencies and not others. Of the 599 non-PLATO students who responded to item 34, 6% (36) stated that they had used PLATO for some work in their course. Of the 541 students who responded to item 35, 9% (50) stated that they spent from one hour to more than four hours using a PLATO terminal for some work in their course. In this case, we cannot show conclusively that these students did not use the PLATO system in the courses in the evaluation. Students could have used the "sign-on information" of other students. They might have gained access to courseware in demonstration courses. However, there is evidence that the responses of many of these students are simply due to inadvertence

Table 6.4.1

Responses of non-PLATO Students
Fall 1975 Semester

		% Yes	% No
26.	Have you heard about the PLATO computer terminals in your school?	79.8	20.2
27.	Has anyone ever showed you how the PLATO terminals work?	48.3	51.7
28.	Have you ever discussed PLATO with other students or a teacher?	52.4	47.6
29.	Have you ever used a PLATO terminal yourself?	40.9	59.1
30.	Do you wish this course had been taught using PLATO?	36.8	63.2
31.	Do you think the students who used the PLATO terminals were lucky?	40.5	59.5
32.	Would you like to take a course next semester that does use the PLATO computer terminals?	54.1	45.9
33.	Did you use a PLATO terminal at any time during this semester?	27.5	72.5
34.	Did you use a PLATO terminal for any work in this course?	6.0	94.0

35. If you did use a PLATO terminal for work in this course, approximately how many hours did you spend using it for this course?

	%
One	1.3
Two	2.4
Three	1.9
Four	2.0
More than Four	1.7
Did not use PLATO	90.8

in completing the questionnaire. A check of the raw data showed that only 29 students answered both questions positively. Of these 29 students, 59% (17 students) responded that they would like to take a course in which PLATO is used in the next semester. This is approximately the same response rate as that of the general population (54%). In addition, these students were distributed across colleges and subject areas so their general effect in the analyses of the evaluation is probably negligible.

The data in Table 6.4.1 show that, although only 28% of the students had used a PLATO terminal during the semester, 80% of the students knew about the terminals, 48% had been shown how the terminals work, 52% had discussed PLATO with other students or instructors, and 41% had used a PLATO terminal at some time. Although only 37% of the students wished that their course in this evaluation had been taught using PLATO and only 41% thought that the students who used PLATO were lucky, 54% stated that they would like to take a course in the next semester using PLATO. Although these results are not as highly favorable to PLATO as those of the PLATO students in the evaluation, they indicate the desire of many students to use PLATO if the opportunity is presented.

In light of these data, the contamination of the treatment and control groups in the evaluation appears to be negligible, a further indication of the considerable effort made by instructors and site personnel in controlling student access to PLATO in the courses targeted in the evaluation.

6.5 PLATO instructors

The results of the PLATO instructor survey are given in Table 6.5.1. Instructor experience (item 1) varied from one semester to more than four semesters with approximately equal numbers of instructors at each of the five levels of experience.

These data show that the instructors who used PLATO are strongly committed to the continuing use of the system. On item 2, 63% of the instructors intended to definitely continue using the system, and 26% thought they probably would. Only one instructor expressed the intention of probably not continuing.

Table 6.5.1

Responses of PLATO Instructors

	NUMBER OF OBSERVATIONS	TOTAL 88	
	ITEMS AND ALTERNATIVES	FREQ	PERCENT
1	APPROXIMATELY HOW LONG HAVE YOU BEEN USING PLATO		
	ONE SEMESTER	22	25.00
	TWO SEMESTERS	15	17.05
	THREE SEMESTERS	13	14.77
	FOUR SEMESTERS	18	20.45
	MORE THAN FOUR SEMESTERS	20	22.73
	MULTIPLE RESPONSE	0	0.0
	NO RESPONSE	0	0.0
2	DO YOU INTEND TO USE PLATO AGAIN IF YOU TEACH THE SAME COURSE		
	DEFINITELY	55	62.50
	PROBABLY	23	26.14
	NOT SURE	9	10.23
	PROBABLY NOT	1	1.14
	DEFINITELY NOT	0	0.0
	MULTIPLE RESPONSE	0	0.0
	NO RESPONSE	0	0.0
3	WHICH STUDENTS DO YOU THINK PROFIT MOST FROM PLATO		
	HIGHER ABILITY STUDENTS	27	30.68
	LOWER ABILITY STUDENTS	27	30.68
	ALL STUDENTS PROFIT EQUALLY	22	25.00
	MULTIPLE RESPONSE	0	0.0
	NO RESPONSE	12	13.64
4	DO YOU THINK PLATO CONTRIBUTES TOWARD BETTER STUDENT ATTENDANCE		
	DEFINITELY	3	3.41
	PROBABLY	20	22.73
	NOT SURE	32	36.36
	PROBABLY NOT	29	32.95
	DEFINITELY NOT	3	3.41
	MULTIPLE RESPONSE	0	0.0
	NO RESPONSE	1	1.14
5	DO YOU GIVE EXTRA CREDIT TO STUDENTS FOR USING PLATO		
	YES	15	17.05
	NO	73	82.95
	MULTIPLE RESPONSE	0	0.0
	NO RESPONSE	0	0.0
6	IS THE REGULARLY SCHEDULED PLATO LAB REQUIRED OR VOLUNTARY		
	REQUIRED	72	81.82
	VOLUNTARY	12	13.64
	MULTIPLE RESPONSE	3	3.41
	NO RESPONSE	1	1.14

NUMBER OF OBSERVATIONS	TOTAL 88	
ITEMS AND ALTERNATIVES	FREQ	PERCENT
7 IF MORE LESSONS AND TERMINALS BECOME AVAILABLE WILL YOU USE PLATO MORE		
DEFINITELY	21	23.86
PROBABLY	31	35.23
NOT SURE	18	20.45
PROBABLY NOT	15	17.05
DEFINITELY NOT	3	3.41
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	0	0.0
8 COULD YOUR ENTIRE COURSE BE TAUGHT ON PLATO		
DEFINITELY	1	1.14
PROBABLY	7	7.95
NOT SURE	2	2.27
PROBABLY NOT	19	21.59
DEFINITELY NOT	59	67.05
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	0	0.0
9 SHOULD YOUR ENTIRE COURSE BE TAUGHT ON PLATO		
DEFINITELY	1	1.14
PROBABLY	2	2.27
NOT SURE	3	3.41
PROBABLY NOT	14	15.91
DEFINITELY NOT	68	77.27
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	0	0.0
10 USED PLATO THIS SEMESTER TO REPLACE PORTIONS OF CLASSROOM INSTRUCTION		
YES	42	47.73
NO	46	52.27
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	0	0.0
11 USED PLATO THIS SEMESTER TO PROVIDE REVIEW AND PRACTICE WORK		
YES	78	88.64
NO	10	11.36
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	0	0.0
12 USED PLATO THIS SEMESTER TO REPLACE LABORATORY WORK		
YES	8	9.09
NO	80	90.91
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	0	0.0

NUMBER OF OBSERVATIONS	TOTAL 88	
ITEMS AND ALTERNATIVES	FREQ	PERCENT
13 USED PLATO THIS SEMESTER TO REPLACE HOMEWORK		
YES	8	9.09
NO	80	90.91
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	0	0.0
14 USED PLATO THIS SEMESTER TO SUPPLEMENT HOMEWORK		
YES	45	51.14
NO	43	48.86
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	0	0.0
15 USED PLATO THIS SEMESTER: SPECIFIED OTHER USE		
YES	14	15.91
NO	74	84.09
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	0	0.0
16 OPTIMAL AMOUNT OF THE COURSE TO DEVOTE TO PLATO		
THE ENTIRE COURSE	1	1.14
TWO-THIRDS OF THE COURSE	5	5.68
ONE-HALF OF THE COURSE	8	9.09
ONE-THIRD OF THE COURSE	24	27.27
LESS THAN ONE-THIRD OF THE COURSE	30	34.09
OTHER (PLEASE SPECIFY)	20	22.73
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	0	0.0
17 DO THE STUDENTS ATTEND BETTER ON PLATO DAYS		
YES	10	11.36
NO	46	52.27
NOT SURE	27	30.68
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	5	5.68
18 TIME SPENT BY STUDENTS USING PLATO OUTSIDE SCHEDULED CLASS		
A GREAT AMOUNT	2	2.27
A SMALL AMOUNT	47	53.41
VERY LITTLE	20	22.73
NONE AT ALL	5	5.68
I DON'T KNOW	11	12.50
MULTIPLE RESPONSE	1	1.14
NO RESPONSE	2	2.27

	TOTAL	
NUMBER OF OBSERVATIONS	88	
ITEMS AND ALTERNATIVES	FREQ	PERCENT
19 WOULD STUDENTS SPEND MORE FREE TIME IF MORE TERMINALS WERE AVAILABLE		
DEFINITELY	8	9.09
PROBABLY	42	47.73
NOT SURE	22	25.00
PROBABLY NOT	14	15.91
DEFINITELY NOT	2	2.27
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	0	0.0
20 DO YOU HAVE MORE OR LESS CONTACT WITH STUDENTS BECAUSE OF PLATO		
MUCH MORE	4	4.55
SOMEWHAT MORE	30	34.09
SOMEWHAT LESS	11	12.50
MUCH LESS	2	2.27
ABOUT THE SAME AS WITHOUT PLATO	41	46.59
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	0	0.0
21 AMOUNT OF WORK YOU DO FOR THE COURSE BECAUSE OF PLATO		
GREAT INCREASE	7	7.95
SLIGHT INCREASE	22	25.00
NO CHANGE	40	45.45
SLIGHT DECREASE	16	18.18
GREAT DECREASE	2	2.27
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	1	1.14
22 HAS THE USE OF PLATO RELIEVED YOU OF ANY ROUTINE DUTIES		
DEFINITELY	9	10.23
PROBABLY	21	23.86
NOT SURE	7	7.95
PROBABLY NOT	24	27.27
DEFINITELY NOT	27	30.68
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	0	0.0
23 HAS THE USE OF PLATO AFFECTED YOUR TEACHING METHODS		
DEFINITELY	15	17.05
PROBABLY	23	26.14
NOT SURE	7	7.95
PROBABLY NOT	27	30.68
DEFINITELY NOT	15	17.05
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	1	1.14

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                                                                TOTAL
NUMBER OF OBSERVATIONS                                            88

     ITEMS  AND
    ALTERNATIVES                                               FREQ  PERCENT

  24  WERE THERE A SUFFICIENT NUMBER OF TERMINALS AVAILABLE
           YES, ALWAYS                                          34    38.64
           MORE THAN HALF THE TIME                              27    30.68
           ABOUT HALF THE TIME                                  10    11.36
           LESS THAN HALF THE TIME                               5     5.68
           THERE WERE NEVER ENOUGH TERMINALS                    12    13.64
           MULTIPLE RESPONSE                                     0     0.0
         NO RESPONSE                                             0     0.0

  25  WHAT DO YOU THINK ABOUT STUDENTS SHARING TERMINALS
           VERY UNDESIRABLE                                     31    35.23
           UNDESIRABLE BUT NOT SERIOUS                          41    46.59
           DESIRABLE                                             7     7.95
           VERY DESIRABLE                                        1     1.14
           NO OPINION                                            7     7.95
           MULTIPLE RESPONSE                                     0     0.0
         NO RESPONSE                                             1     1.14

  26  HAVE SYSTEM FAILURES AND/OR RED LIGHTING BEEN A PROBLEM
           YES, A MAJOR PROBLEM                                  6     6.82
           YES,A MINOR PROBLEM                                  51    57.95
           NO, NOT A PROBLEM                                    29    32.95
           MULTIPLE RESPONSE                                     0     0.0
         NO RESPONSE                                             2     2.27

  27  HOW MANY PLATO LESSONS HAVE YOU DESIGNED OR HELPED TO DESIGN
           ZERO                                                 49    55.68
           ONE                                                  14    15.91
           TWO                                                   6     6.82
           THREE                                                 6     6.82
           FOUR                                                  4     4.55
           FIVE                                                  0     0.0
           SIX                                                   0     0.0
           SEVEN                                                 0     0.0
           EIGHT OR MORE                                         8     9.09
           MULTIPLE RESPONSE                                     1     1.14
         NO RESPONSE                                             0     0.0
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NUMBER OF OBSERVATIONS	TOTAL 88	
ITEMS AND ALTERNATIVES	FREQ	PERCENT
28 HOW MANY PLATO LESSONS HAVE YOU PROGRAMMED		
ZERO	61	69.32
ONE	16	18.18
TWO	2	2.27
THREE	0	0.0
FOUR	2	2.27
FIVE	1	1.14
SIX	0	0.0
SEVEN	0	0.0
EIGHT OR MORE	5	5.68
MULTIPLE RESPONSE	1	1.14
NO RESPONSE	0	0.0
29 HOW DIFFICULT DO YOU THINK IT IS TO DEVELOP A PLATO LESSON		
VERY DIFFICULT	14	15.91
MODERATELY DIFFICULT	47	53.41
NOT DIFFICULT AT ALL	5	5.68
NOT SURE	19	21.59
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	3	3.41
30 HOW DIFFICULT DO YOU REGARD THE USE OF THE TUTOR LANGUAGE		
VERY DIFFICULT	1	1.14
MODERATELY DIFFICULT	25	28.41
NOT DIFFICULT AT ALL	9	10.23
I HAVE NOT USED THE TUTOR LANGUAGE	50	56.82
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	3	3.41
31 HAVE YOU EXPERIENCED DIFFICULTY IN OBTAINING LESSON SPACE FOR AUTHORING		
GREAT DIFFICULTY	3	3.41
SOME DIFFICULTY	6	6.82
NO DIFFICULTY	21	23.86
NEVER TRIED TO OBTAIN LESSON SPACE	56	63.64
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	2	2.27
32 HOW HELPFUL DO YOU REGARD THE UNIVERSITY OF ILLINOIS EXTENSION COURSE		
VERY HELPFUL	15	17.05
MODERATELY HELPFUL	18	20.45
NOT HELPFUL AT ALL	1	1.14
I HAVE NOT TAKEN SUCH A COURSE	52	59.09
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	2	2.27

NUMBER OF OBSERVATIONS	TOTAL 88	
ITEMS AND ALTERNATIVES	FREQ	PERCENT
33 HOW HELPFUL DO YOU REGARD THE CERL SUBJECT MATTER COORDINATOR		
VERY HELPFUL	39	44.32
MODERATELY HELPFUL	18	20.45
NOT HELPFUL AT ALL	2	2.27
NO CONTACT WITH COORDINATOR	23	26.14
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	6	6.82
34 HOW HELPFUL DO YOU REGARD THE PLATO SITE COORDINATOR		
VERY HELPFUL	70	79.55
MODERATELY HELPFUL	16	18.18
NOT HELPFUL AT ALL	1	1.14
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	1	1.14
35 HOW HELPFUL DO YOU REGARD THE COURSE RECORDS		
VERY HELPFUL	44	50.00
MODERATELY HELPFUL	34	38.64
NOT HELPFUL AT ALL	8	9.09
I AM NOT AWARE OF SUCH COURSE RECORDS	0	0.0
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	2	2.27
36 HOW EFFECTIVE DO YOU REGARD THE PLATO SUBJECT MATTER MEETINGS		
VERY EFFECTIVE	16	18.18
MODERATELY EFFECTIVE	28	31.82
NOT EFFECTIVE AT ALL	3	3.41
I HAVE NEVER ATTENDED SUCH A MEETING	38	43.18
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	3	3.41
37 HOW ADEQUATE ARE THE NUMBER OF PLATO LESSONS AVAILABLE		
VERY ADEQUATE	14	15.91
ADEQUATE	50	56.82
INADEQUATE	19	21.59
VERY INADEQUATE	2	2.27
NOT SURE	1	1.14
MULTIPLE RESPONSE	1	1.14
NO RESPONSE	1	1.14
38 HOW ADEQUATE IS THE CONTENT OF THE LESSONS AVAILABLE		
VERY ADEQUATE	14	15.91
ADEQUATE	62	70.45
INADEQUATE	10	11.36
VERY INADEQUATE	0	0.0
NOT SURE	0	0.0
MULTIPLE RESPONSE	1	1.14
NO RESPONSE	1	1.14

NUMBER OF OBSERVATIONS		TOTAL 88	
	ITEMS AND ALTERNATIVES	FREQ	PERCENT
39	HOW ADEQUATE IS THE CLARITY OF THE MATERIAL PRESENTED		
	VERY ADEQUATE	11	12.50
	ADEQUATE	60	68.18
	INADEQUATE	11	12.50
	VERY INADEQUATE	1	1.14
	NOT SURE	2	2.27
	MULTIPLE RESPONSE	2	2.27
	NO RESPONSE	1	1.14
40	HOW ADEQUATE IS THE USE OF EXAMPLES AND ILLUSTRATIONS		
	VERY ADEQUATE	15	17.05
	ADEQUATE	59	67.05
	INADEQUATE	8	9.09
	VERY INADEQUATE	1	1.14
	NOT SURE	3	3.41
	MULTIPLE RESPONSE	0	0.0
	NO RESPONSE	2	2.27
41	HOW ADEQUATE IS THE HELP PROVIDED FOR STUDENTS IN THE PLATO LESSONS		
	VERY ADEQUATE	9	10.23
	ADEQUATE	48	54.55
	INADEQUATE	15	17.05
	VERY INADEQUATE	2	2.27
	NOT SURE	10	11.36
	MULTIPLE RESPONSE	3	3.41
	NO RESPONSE	1	1.14
42	IN GENERAL,HOW DIFFICULT ARE THE PLATO LESSONS FOR YOUR STUDENTS		
	VERY DIFFICULT	0	0.0
	DIFFICULT	8	9.09
	ABOUT RIGHT	70	79.55
	EASY	5	5.68
	VERY EASY	0	0.0
	MULTIPLE RESPONSE	3	3.41
	NO RESPONSE	2	2.27
43	HAVE CONTENT ERRORS IN THE LESSONS BEEN A PROBLEM		
	YES, A MAJOR PROBLEM	1	1.14
	YES, A MINOR PROBLEM	36	40.91
	NO, NOT A PROBLEM	45	51.14
	MULTIPLE RESPONSE	0	0.0
	NO RESPONSE	6	6.82

	TOTAL	
NUMBER OF OBSERVATIONS	88	
ITEMS AND ALTERNATIVES	FREQ	PERCENT
44 HAVE MECHANICAL ERRORS IN THE LESSONS BEEN A PROBLEM		
YES, A MAJOR PROBLEM	1	1.14
YES, A MINOR PROBLEM	44	50.00
NO, NOT A PROBLEM	34	38.64
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	9	10.23
45 HOW DIFFICULT IS IT FOR THE STUDENTS TO SIGN ON		
VERY DIFFICULT	0	0.0
DIFFICULT	2	2.27
ABOUT RIGHT	35	39.77
EASY	34	38.64
VERY EASY	13	14.77
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	4	4.55
46 HOW DIFFICULT IS IT FOR THE STUDENTS TO USE THE INDEX		
VERY DIFFICULT	0	0.0
DIFFICULT	6	6.82
ABOUT RIGHT	39	44.32
EASY	26	29.55
VERY EASY	11	12.50
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	6	6.82
47 HOW DIFFICULT IS IT FOR THE STUDENTS TO LOCATE THE CORRECT LESSON		
VERY DIFFICULT	1	1.14
DIFFICULT	5	5.68
ABOUT RIGHT	44	50.00
EASY	26	29.55
VERY EASY	8	9.09
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	4	4.55
48 HOW DIFFICULT IS IT FOR THE STUDENTS TO GET OUT OF A LESSON		
VERY DIFFICULT	2	2.27
DIFFICULT	19	21.59
ABOUT RIGHT	30	34.09
EASY	23	26.14
VERY EASY	11	12.50
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	3	3.41

NUMBER OF OBSERVATIONS	TOTAL 88	
ITEMS AND ALTERNATIVES	FREQ	PERCENT
49 HOW DIFFICULT IS IT FOR THE STUDENTS TO GET INTO A NEW LESSON		
VERY DIFFICULT	2	2.27
DIFFICULT	15	17.05
ABOUT RIGHT	35	39.77
EASY	25	28.41
VERY EASY	8	9.09
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	3	3.41
50 HOW DIFFICULT IS IT FOR THE STUDENTS TO DETERMINE THE CORRECT ANSWER		
VERY DIFFICULT	3	3.41
DIFFICULT	27	30.68
ABOUT RIGHT	48	54.55
EASY	5	5.68
VERY EASY	2	2.27
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	3	3.41
51 HOW DIFFICULT IS IT FOR THE STUDENTS TO INTERPRET PLATO VOCABULARY		
VERY DIFFICULT	0	0.0
DIFFICULT	17	19.32
ABOUT RIGHT	55	62.50
EASY	10	11.36
VERY EASY	1	1.14
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	5	5.68
52 HOW DIFFICULT IS IT FOR THE STUDENTS TO USE THE HELP-TYPE KEYS		
VERY DIFFICULT	0	0.0
DIFFICULT	18	20.45
ABOUT RIGHT	47	53.41
EASY	14	15.91
VERY EASY	1	1.14
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	8	9.09
53 HOW DIFFICULT IS IT FOR THE STUDENTS TO USE THE ON-LINE TESTS		
VERY DIFFICULT	1	1.14
DIFFICULT	8	9.09
ABOUT RIGHT	56	63.64
EASY	6	6.82
VERY EASY	2	2.27
MULTIPLE RESPONSE	1	1.14
NO RESPONSE	14	15.91

NUMBER OF OBSERVATIONS	TOTAL 88	
ITEMS AND ALTERNATIVES	FREQ	PERCENT
54 HOW DIFFICULT IS IT FOR THE STUDENTS TO TYPE		
VERY DIFFICULT	1	1.14
DIFFICULT	19	21.59
ABOUT RIGHT	47	53.41
EASY	11	12.50
VERY EASY	3	3.41
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	7	7.95
55 HOW DIFFICULT IS IT FOR THE STUDENTS TO SIGN OFF		
VERY DIFFICULT	0	0.0
DIFFICULT	2	2.27
ABOUT RIGHT	33	37.50
EASY	34	38.64
VERY EASY	14	15.91
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	5	5.68
56 WHAT IS PLATO'S IMPACT ON STUDENT ACHIEVEMENT		
HIGH POSITIVE	10	11.36
POSITIVE IMPACT	63	71.59
NO IMPACT	13	14.77
NEGATIVE IMPACT	1	1.14
HIGH NEGATIVE IMPACT	0	0.0
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	1	1.14
57 WHAT IS PLATO'S IMPACT ON STUDENT ATTITUDES TOWARD SUBJECT MATTER		
HIGH POSITIVE	11	12.50
POSITIVE IMPACT	59	67.05
NO IMPACT	16	18.18
NEGATIVE IMPACT	0	0.0
HIGH NEGATIVE IMPACT	0	0.0
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	2	2.27
58 WHAT IS PLATO'S IMPACT ON COURSE COMPLETION RATES		
HIGH POSITIVE	1	1.14
POSITIVE IMPACT	24	27.27
NO IMPACT	53	60.23
NEGATIVE IMPACT	7	7.95
HIGH NEGATIVE IMPACT	1	1.14
MULTIPLE RESPONSE	0	0.0
NO RESPONSE	2	2.27

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                                                                    TOTAL
NUMBER OF OBSERVATIONS                                               88

     ITEMS  AND
    ALTERNATIVES                                                    FREQ  PERCENT

  59  WHAT IS PLATO'S IMPACT ON QUALITY OF STUDENT-INSTRUCTOR INTERACTION
           HIGH POSITIVE                                              6    6.82
           POSITIVE IMPACT                                           49   55.68
           NO IMPACT                                                 28   31.82
           NEGATIVE IMPACT                                            2    2.27
           HIGH NEGATIVE IMPACT                                       0    0.0
           MULTIPLE RESPONSE                                          1    1.14
         NO RESPONSE                                                  2    2.27

  60  WHAT IS PLATO'S IMPACT ON QUALITY OF STUDENT-STUDENT INTERACTION
           HIGH POSITIVE                                              8    9.09
           POSITIVE IMPACT                                           48   54.55
           NO IMPACT                                                 28   31.82
           NEGATIVE IMPACT                                            2    2.27
           HIGH NEGATIVE IMPACT                                       0    0.0
           MULTIPLE RESPONSE                                          0    0.0
         NO RESPONSE                                                  2    2.27

  61  WHAT IS PLATO'S IMPACT ON FACULTY DUTIES AND RESPONSIBILITIES
           HIGH POSITIVE                                              4    4.55
           POSITIVE IMPACT                                           39   44.32
           NO IMPACT                                                 36   40.91
           NEGATIVE IMPACT                                            6    6.82
           HIGH NEGATIVE IMPACT                                       0    0.0
           MULTIPLE RESPONSE                                          0    0.0
         NO RESPONSE                                                  3    3.41
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Instructors were evenly divided (item 3) on their opinions about the value of PLATO for higher and lower ability students. Although 26% of the instructors thought that PLATO does contribute to better student attendance, most (73%) were not sure or responded negatively.

Although most (83%) did not give extra credit for using PLATO, 17% did. This information provides a useful caution against using student grades in assessing treatment effects as they may be somewhat inflated if extra credit is given to PLATO students.

The response to item 6 indicates that some instructors (14%) did not require students to attend all or some of their PLATO sessions. In general, the PLATO laboratory sessions in the courses in the evaluation were considered the same as regularly scheduled class periods.

More than half (59%) of the PLATO instructors would probably or definitely use PLATO more if more lessons and terminals were available. This response should be interpreted in conjunction with the responses to items 8, 9, and 16. The vast majority (67% and 77%) of the instructors agreed that their entire course could not and should not be taught exclusively on PLATO. The instructors generally (61%) agreed with the intention of the developers that about one-third or less of the course be devoted to PLATO. About 16% thought that half the course or more would be optimal. Other suggestions included use for homework only, laboratory work, and independent study.

Item 17 was used as a further check on the information obtained in item 4 on motivation of students to attend the PLATO sessions. In general, instructors perceived little effect of PLATO on student attendance although 11% did perceive such an effect.

Approximately 78% of the instructors thought that students did spend some time using PLATO outside of the regularly scheduled PLATO class time (item 18). Most (76%) thought that the time spent was small however. The instructor responses to item 19 indicated that students would probably spend more free time using PLATO if more terminals were available. This result agrees with the student results previously mentioned. The data do not prove that greater availability of terminals would lead to greater usage of the system since we did not perform an experiment to check this assertion, but the desire and perceptions reported certainly point in that direction.

As was the case in the student results, the instructor responses contradict one of the common concerns about computer-assisted instruction, namely that students will be isolated and lose contact with instructors. Approximately 39% of the instructors thought that they had more contact with students because of PLATO; 47% thought that contact with students was unaffected by PLATO; and, only 15% thought that their contact with students was decreased because of PLATO.

One interesting hypothesis about computer-assisted instruction is that it might decrease the workload of instructors. Based on the information gained in this evaluation, this hypothesis is not supported. On the contrary, 33% of the instructors felt that using PLATO actually increased the amount of work necessary for the course in which PLATO was used, and 45% felt that using PLATO had no effect on workload. Some decrease in workload was perceived by 20% of the instructors. However, 34% of the instructors thought that PLATO did relieve them of some routine duties. The majority (58%) did not think they had been relieved of any routine duties. Instructors were about evenly divided (43% vs. 47% on item 23) on whether or not PLATO affected their teaching methods.

In items 24-26, instructors were asked to comment on three areas of concern in the implementation and demonstration: (a) the adequacy of the number of terminals, (b) the desirability of student sharing of terminals, and (c) the disruption caused by system failures and/or red-lighting. Regarding the number of terminals available for their students, 39% of the instructors responded that there were always enough terminals available, 14% responded that there were never enough, and 48% responded that there were insufficient numbers of terminals available for all of their students part of the time when they intended to use them. Only 9% of the instructors thought that it was desirable for students to share terminals. The vast majority (82%) thought that students' sharing terminals was undesirable although 47% did not consider sharing a serious problem. Although only 7% of the instructors considered system failures and/or red-lighting a major problem, 58% considered these disruptions a minor problem. In observing the PLATO classes, the evaluators came to a similar conclusion. Malfunctions in the PLATO system were bothersome but not a major problem in the implementation and demonstration.

One objective of the PLATO project was to incorporate instructors into the process of designing and/or programming lessons. The responses to items 27 and 28 show that approximately 43% of the instructors did design one or more lessons and 29% of the instructors actually programmed one or more lessons. A small percentage of instructors (9%) designed eight or more lessons, and 6% programmed eight or more lessons. Only 6% of the instructors considered developing a PLATO lesson "not difficult." The majority of instructors (69%) considered developing PLATO lessons moderately or very difficult. It had been hoped that the TUTOR language used to develop PLATO lessons would be sufficiently easy for instructors to use in developing lessons. In the implementation and demonstration, 57% of the instructors never used the TUTOR language. Of those (35 instructors) who did, 26% found it to be "not difficult at all." The remaining 74% found it to be moderately or very difficult.

To summarize the information in items 27-30, about half (43%) of the participating instructors did help to design lessons. Almost one-third (29%) actually programmed lessons. The TUTOR language was probably more difficult for the instructors than had originally been hoped, but not so difficult as to keep instructors from developing lessons if they were interested in doing so.

In items 32-36, instructors were asked to rate certain components of the PLATO implementation and demonstration considered in its broad context: (a) the various extension courses available for learning about PLATO; (b) the assistance provided to PLATO users by the liaison staff of CERL, the local site coordinators, and the course records available on-line on PLATO; and (c) the meetings held for PLATO instructors in the various subject areas. The purpose of this information was to provide some input for decision makers about what components of the project were perceived as most helpful by the instructors. Of those instructors who participated in the extension courses, 97% considered the courses moderately or very helpful. Only one instructor considered the extension courses "not helpful at all." Of the 82 instructors who responded to item 33, 28% had no contact with the CERL subject matter coordinators. Of those who did, 96% considered the contact moderately or very helpful. Similarly, 99% of those responding considered their contact with the local site coordinators moderately or very helpful; 80% considered the local site coordinators very helpful.

Items 37-55 were designed to gain information about very specific aspects of the PLATO system. The resources of the evaluation project did not permit a detailed content analysis of lessons. At this stage of the implementation, with lessons undergoing considerable development and revision, it is questionable whether such an assessment would have been possible or useful. Nevertheless, we have collected information about how the instructors who used the system viewed such aspects as number and content of lessons available, clarity of materials, use of examples and illustrations, assistance provided to students by the various help sequences in lessons, content and mechanical errors in lessons, difficulty level of lessons, student difficulties in signing-on, signing-off, using the index, getting into and out of lessons, difficulty of the vocabulary level used in lessons, student difficulties in using the help-type keys, the on-line tests, and the keyboard in general.

The vast majority (72%-86%) of the instructors judged the number and content of lessons, the clarity of the material presented, and the use of examples and illustrations to be adequate or very adequate for their students.

Although the majority (65%) of the instructors thought that the help provided for students was adequate or very adequate, a sizable minority (19%) thought that the help provided was inadequate or very inadequate. The independent observers on the evaluation staff did note occasions when no help was available to students who attempted to get help by using the help key. This result has implications for future lesson writers. Although there may be a limit to the amount of help that can reasonably be provided in each lesson, the need for more help within lessons was noted by a sizable number of instructors and by the independent observers.

About half the instructors (41%-50%) considered content and mechanical errors in lessons to be a minor problem. Only one instructor viewed these problems as major.

The vast majority (85%) of the instructors judged the difficulty level of the PLATO lessons to be easy or about right for their students. Of course, there was variation in the PLATO lessons, but this result indicates a general satisfaction by the instructors with the available PLATO lessons.

A very small minority (2%-7%) of instructors rated any of the following aspects of the system as difficult for students: signing-on, signing-off, using an index, and locating the correct lesson to enter. On the other hand, a sizable minority (19%-24%) judged the following aspects to be difficult or very difficult: getting out of a lesson, getting into a new lesson, interpreting the PLATO vocabulary, and using help-type keys. The most difficult aspect for students in using lessons (judged difficult or very difficult by 34% of the instructors) was determining the correct answer for PLATO. The evaluators did note this to be somewhat of a problem in the observation phase of the evaluation. In some lessons, the response that would be accepted as correct was very narrowly constrained. Of course, it is difficult to anticipate all equivalent responses to an expected response, but this was an aspect of the lessons that caused considerable frustration to students and sometimes embarrassment to instructors who were not very familiar with the particular idiosyncracies of answer judging in specific lessons.

The last few items (56-61) in the instructor questionnaire requested instructors to rate the impact of PLATO from negative to positive on student attitudes, achievement, and attrition; on student-instructor interaction, student-student interaction; and on faculty duties and responsibilities. In general, a large majority (80%-83%) of the instructors thought that PLATO had a positive or highly positive impact on student attitudes and achievement. The majority (60%) thought that PLATO had no impact on course completion rates, although 28% thought that it had a positive effect and 9% thought that it had a negative effect.

The majority (63%-64%) thought that PLATO had a positive impact on student-instructor and student-student interactions. Very few instructors (2%) considered the impact of PLATO on student-instructor and student-student interactions to be negative.

Finally, approximately 49% of the instructors thought that PLATO had a positive effect on their duties and responsibilities while 7% thought it had a negative impact. These responses indicate quite clearly that instructors who used the PLATO system viewed it favorably.

6.6 Non-PLATO instructors

In the basic evaluation design, 32 PLATO instructors also taught non-PLATO classes. When such comparison classes could not be obtained, additional instructors were asked to participate in the evaluation and to allow their classes to serve as comparison classes. Fifteen community college instructors agreed to participate in the evaluation under this condition in the Fall 1975 semester. Of the 15, 14 completed a 34 item questionnaire at the end of the semester. The responses to this questionnaire are given in Table 6.6.1. Two of the 14 had taught a class using PLATO in the past but were not using PLATO in the Fall 1975 semester. Nine of the 14 had never operated a PLATO terminal; one instructor did not respond to the question so we do not know for sure whether that instructor had in fact operated a PLATO terminal.

Table 6.6.1

Responses of non-PLATO Instructors

	TOTAL	
NUMBER OF OBSERVATIONS	14	
ITEMS AND ALTERNATIVES	FREQ	PERCENT
1 DO YOU HAVE SOME KNOWLEDGE OF THE PLATO PROGRAM		
YES	13	92.86
NO	0	0.0
NO RESPONSE	1	7.14
2 HAVE YOU OBSERVED PLATO IN OPERATION		
YES	10	71.43
NO	3	21.43
NO RESPONSE	1	7.14
3 HAVE YOU EVER OPERATED A PLATO TERMINAL		
YES	4	28.57
NO	9	64.29
NO RESPONSE	1	7.14
4 HAVE YOU DISCUSSED PLATO WITH STUDENTS		
YES	10	71.43
NO	3	21.43
NO RESPONSE	1	7.14
5 HAVE YOU DISCUSSED PLATO WITH OTHER FACULTY MEMBERS		
YES	11	78.57
NO	2	14.29
NO RESPONSE	1	7.14
6 HAVE YOU DISCUSSED PLATO WITH VISITORS TO YOUR COLLEGE		
YES	4	28.57
NO	9	64.29
NO RESPONSE	1	7.14
7 HAVE YOU EVER ATTENDED A PLATO ORIENTATION SESSION		
YES	2	14.29
NO	11	78.57
NO RESPONSE	1	7.14
8 HAVE YOU TAUGHT A CLASS USING PLATO		
YES	2	14.29
NO	11	78.57
NO RESPONSE	1	7.14
9 ARE YOU INTERESTED IN USING PLATO AS PART OF YOUR INSTRUCTION		
VERY INTERESTED	1	7.14
SOMEWHAT INTERESTED	6	42.86
NOT SURE	2	14.29
NOT INTERESTED	4	28.57
DEFINITELY NOT INTERESTED	0	0.0
NO RESPONSE	1	7.14

```
                                                                 TOTAL
NUMBER OF OBSERVATIONS                                             14

     ITEMS  AND
   ALTERNATIVES                                              FREQ  PERCENT

  10  MY COLLEAGUES SEEM TO BE FAVORABLY IMPRESSED WITH PLATO
            AGREE                                               6   42.86
            DISAGREE                                            5   35.71
         NO RESPONSE                                            3   21.43

  11  I'D LIKE TO LEARN MORE ABOUT PLATO BUT I HAVE NOT HAD THE TIME
            AGREE                                               6   42.86
            DISAGREE                                            6   42.86
         NO RESPONSE                                            2   14.29

  12  STUDENTS BECOME MORE ACTIVE IN THEIR OWN LEARNING THROUGH PLATO
            AGREE                                               3   21.43
            DISAGREE                                            7   50.00
         NO RESPONSE                                            4   28.57

  13  PLATO IS A PASSING FAD
            AGREE                                               3   21.43
            DISAGREE                                            6   42.86
         NO RESPONSE                                            5   35.71

  14  PLATO RELIEVES INSTRUCTORS OF MANY ROUTINE DUTIES
            AGREE                                               1    7.14
            DISAGREE                                            8   57.14
         NO RESPONSE                                            5   35.71

  15  IT WOULD BE DIFFICULT TO JUDGE STUDENTS LEARNING USING PLATO
            AGREE                                               5   35.71
            DISAGREE                                            4   28.57
         NO RESPONSE                                            5   35.71

  16  SOME OF MY STUDENTS SEEM TO BE FAVORABLY IMPRESSED WITH PLATO
            AGREE                                               7   50.00
            DISAGREE                                            3   21.43
         NO RESPONSE                                            4   28.57

  17  I DON'T THINK PLATO OFFERS ANY LESSONS IN THE AREAS THAT I TEACH
            AGREE                                               1    7.14
            DISAGREE                                           11   78.57
         NO RESPONSE                                            2   14.29

  18  PLATO DOES NOT DEVELOP INTEREST IN A SUBJECT AS MUCH AS REGULAR CLASSROOM
            AGREE                                               7   50.00
            DISAGREE                                            4   28.57
         NO RESPONSE                                            3   21.43
```

	ITEMS AND ALTERNATIVES	FREQ	PERCENT
	NUMBER OF OBSERVATIONS	TOTAL 14	
19	PLATO PROVIDES A GREATER OPPORTUNITY FOR INSTRUCTION ON AN INDIVID. BASIS		
	AGREE	4	28.57
	DISAGREE	5	35.71
	NO RESPONSE	5	35.71
20	PLATO IS DEHUMANIZING FOR THE STUDENTS		
	AGREE	2	14.29
	DISAGREE	9	64.29
	NO RESPONSE	3	21.43
21	PLATO TERMINAL WOULD PROBABLY IMPROVE STUDENTS LEARNING STRATEGIES		
	AGREE	5	35.71
	DISAGREE	4	28.57
	NO RESPUNSE	5	35.71
22	I WOULD FEEL COMFORTABLE USING PLATO AS PART OF MY COURSE INSTRUCTION		
	AGREE	7	50.00
	DISAGREE	4	28.57
	NO RESPONSE	3	21.43
23	WITH PLATO STUDENTS RECEIVE LESS INDIVIDUAL ATTENTION		
	AGREE	3	21.43
	DISAGREE	5	35.71
	NO RESPONSE	6	42.86
24	PLATO IS ONE OF THE MOST SIGNIFICANT DEVELOPMENTS IN EDUCATION TODAY		
	AGREE	2	14.29
	DISAGREE	8	57.14
	NO RESPONSE	4	28.57
25	BREAKDOWNS OF THE PLATO SYSTEM DISRUPT STUDENTS LEARNING		
	AGREE	5	35.71
	DISAGREE	4	28.57
	NO RESPONSE	5	35.71
26	PLATO TAKES UP VALUABLE CLASS TIME		
	AGREE	5	35.71
	DISAGREE	4	28.57
	NO RESPONSE	5	35.71
27	PLATO IS A VALUABLE RESOURCE FOR THIS INSTITUTION		
	AGREE	9	64.29
	DISAGREE	2	14.29
	NO RESPONSE	3	21.43

NUMBER OF OBSERVATIONS		TOTAL 14
ITEMS AND ALTERNATIVES	FREQ	PERCENT
28 PLATO SUPPRESSES STUDENT CREATIVITY		
AGREE	3	21.43
DISAGREE	8	57.14
NO RESPONSE	3	21.43
29 WHAT IS PLATO'S IMPACT ON STUDENT ACHIEVEMENT		
HIGH POSITIVE IMPACT	0	0.0
POSITIVE IMPACT	6	42.86
NO IMPACT	3	21.43
NEGATIVE IMPACT	1	7.14
HIGH NEGATIVE IMPACT	0	0.0
NO RESPONSE	4	28.57
30 WHAT IS PLATO'S IMPACT ON STUDENT ATTITUDES TOWARD SUBJECT MATTER		
HIGH POSITIVE IMPACT	0	0.0
POSITIVE IMPACT	6	42.86
NO IMPACT	3	21.43
NEGATIVE IMPACT	1	7.14
HIGH NEGATIVE IMPACT	0	0.0
NO RESPONSE	4	28.57
31 WHAT IS PLATO'S IMPACT ON COURSE COMPLETION RATES		
HIGH POSITIVE IMPACT	0	0.0
POSITIVE IMPACT	2	14.29
NO IMPACT	7	50.00
NEGATIVE IMPACT	0	0.0
HIGH NEGATIVE IMPACT	0	0.0
NO RESPONSE	5	35.71
32 WHAT IS PLATO'S IMPACT ON QUALITY OF STUDENT-INSTRUCTOR INTERACTION		
HIGH POSITIVE IMPACT	0	0.0
POSITIVE IMPACT	4	28.57
NO IMPACT	3	21.43
NEGATIVE IMPACT	2	14.29
HIGH NEGATIVE IMPACT	0	0.0
NO RESPONSE	5	35.71
33 WHAT IS PLATO'S IMPACT ON QUALITY OF STUDENT-STUDENT INTERACTION		
HIGH POSITIVE IMPACT	0	0.0
POSITIVE IMPACT	4	28.57
NO IMPACT	5	35.71
NEGATIVE IMPACT	0	0.0
HIGH NEGATIVE IMPACT	0	0.0
NO RESPONSE	5	35.71

NUMBER OF OBSERVATIONS	TOTAL 14	
ITEMS AND ALTERNATIVES	FREQ	PERCENT
34 WHAT IS PLATO'S IMPACT ON FACULTY DUTIES AND RESPONSIBILITIES		
HIGH POSITIVE IMPACT	0	0.0
POSITIVE IMPACT	4	28.57
NO IMPACT	4	28.57
NEGATIVE IMPACT	2	14.29
HIGH NEGATIVE IMPACT	0	0.0
NO RESPONSE	4	28.57

Nevertheless, the 14 instructors were a group who had generally not used the PLATO system. They were, of course, teaching subjects in the five targeted subject areas, and they were interested enough in the evaluation to participate. Their responses must be interpreted in the light of that information.

The purpose of questioning these instructors was to obtain information about the impact of PLATO on instructors who were not using the system. In general, there was a considerable impact on these instructors. The vast majority (71%-79%) had observed PLATO in operation and had discussed the PLATO system with their colleagues and students. Approximately half of the instructors were somewhat or very interested in using PLATO as part of their instructional activities.

On items 10-35, a sizable minority (14%-46%) of the instructors were reluctant to hazard an opinion on one or more of the items. In view of the small sample to start with, we have not attempted to derive any strong conclusions from these data. In general, at least half of the instructors were willing to agree that some of their students seemed favorably impressed with PLATO (item 16), that they would feel comfortable using PLATO as part of their course instruction (item 22), and that PLATO was a valuable resource in their institution (item 27). More than half (9 and 8) were willing to go on record as disagreeing that PLATO is dehumanizing for students or that is suppresses student creativity.

A sizable minority (29%-36%) were not willing to rate the impact of PLATO on student achievement, attitudes, and completion rates; on student-instructor and student-student interactions; and on faculty duties and responsibilities. Of those who were willing to hazard an opinion, they were more generally positive than negative in their impressions.

To summarize, we do not intend to present these results as conclusive information about the impact of PLATO on all instructors in the participating community colleges. These were instructors in the targeted subject areas who participated in the evaluation. They were not PLATO users in the Fall 1975 semester. The data indicate a favorable impression made on such instructors through indirect contacts with the PLATO system.

6.7 Instructors in both treatment and control conditions

In the evaluation design, 32 instructors served as their own controls. Of the 32, 28 responded to a third questionnaire designed exclusively for this group. The responses received are summarized in Table 6.7.1.

These instructors were unique in that they were PLATO users who agreed not to use PLATO in some of their classes for the purpose of providing useful information in the evaluation. In large part, the success of the evaluation was dependent on their cooperation in keeping the non-PLATO students from being contaminated, so to speak, by the treatment. Their cooperation in this area was excellent, and the evaluators considered them a further source of more detailed information on the impact of the PLATO system.

The ten items in this brief questionnaire were designed to elicit information about the specific students in these instructors' classes rather than the more general type of information about the PLATO system obtained in the general PLATO instructor questionnaire. There were several (6) instructors who taught more than one PLATO or non-PLATO class. They were asked in a letter accompanying the questionnaire to consider their PLATO or non-PLATO sections as a unit, if possible, or to rank order the classes.

The results in items 1 and 2 show that the instructors generally preferred teaching the sections that they thought they would prefer teaching before the semester began. It should be noted that these responses were both made at the end of the semester. We did not collect preference data before the semester began. Such data would have been useful and should be collected in future similar studies if

Table 6.7.1

Responses of Instructors Who Taught Both PLATO and non-PLATO Classes

NUMBER OF OBSERVATIONS	TOTAL 28	
ITEMS AND ALTERNATIVES	FREQ	PERCENT
1 DID YOU PREFER TEACHING THE PLATO OR THE NON-PLATO SECTION		
PLATO	11	39.29
NON-PLATO	6	21.43
NO PREFERENCE	11	39.29
NO RESPONSE	0	0.0
2 WHICH SECTION(S) DID YOU THINK YOU WOULD PREFER TEACHING		
PLATO	13	46.43
NON-PLATO	3	10.71
NO PREFERENCE	12	42.86
NO RESPONSE	0	0.0
3 WHICH SECTION APPEARED TO CONTAIN THE MORE CAPABLE STUDENTS		
PLATO	4	14.29
NON-PLATO	15	53.57
NO PREFERENCE	9	32.14
NO RESPONSE	0	0.0
4 WHICH SECTION APPEARED TO CONTAIN THE MORE MOTIVATED STUDENTS		
PLATO	5	17.86
NON-PLATO	10	35.71
NO PREFERENCE	13	46.43
NO RESPONSE	0	0.0
5 WHICH SECTION APPEARED TO CONTAIN THE HIGHER ACHIEVING STUDENTS		
PLATO	6	21.43
NON-PLATO	15	53.57
NO PREFFRENCE	6	21.43
NO RESPONSE	1	3.57
6 WHICH SECTION HAD THE BETTER ATTENDANCE RECORD DURING THE SEMESTER		
PLATO	4	14.29
NON-PLATO	9	32.14
NO PREFERENCE	15	53.57
NO RESPONSE	0	0.0
7 WHICH SECTION REQUIRED MORE OF YOUR TIME		
PLATO	9	32.14
NON-PLATO	10	35.71
NO PREFERENCE	9	32.14
NO RESPONSE	0	0.0
8 HAVE YOU HAD MORE CONTACT WITH PLATO OR NON-PLATO STUDENTS		
PLATO	10	35.71
NON-PLATO	6	21.43
NO PREFERENCE	12	42.86
NO RESPONSE	0	0.0

NUMBER OF OBSERVATIONS		TOTAL 28
ITEMS AND ALTERNATIVES	FREQ	PERCENT
9 HAVE NON-PLATO STUDENTS COMPLAINED ABOUT NOT BEING ABLE TO USE PLATO		
YES	16	57.14
NO	11	39.29
NO RESPONSE	1	3.57
10 NUMBER OF STUDENTS WHO COMPLAINED ABOUT NOT BEING ABLE TO USE PLATO		
NO STUDENTS	11	39.29
ONE STUDENT	1	3.57
TWO STUDENTS	7	25.00
THREE STUDENTS	3	10.71
FOUR STUDENTS	1	3.57
FIVE STUDENTS	1	3.57
SIX STUDENTS	1	3.57
SEVEN STUDENTS	0	0.0
EIGHT STUDENTS	0	0.0
NINE STUDENTS	0	0.0
TEN STUDENTS	2	7.14
NO RESPONSE	1	3.57

it can be done without interfering with instructor cooperation, a sine qua non in any evaluation carried out under real world conditions.

In spite of the preferences expressed in items 1 and 2 however, these 28 instructors generally rated their non-PLATO classes more favorably than their PLATO classes on ability, motivation, achievement, and attendance. Given the small sample size, the results on any one item are hardly conclusive. However, the general direction on items 3 through 6 is consistent. The results, in conjunction with the responses on the general PLATO questionnaire, indicate that although PLATO instructors generally rate the impact of PLATO on student achievement, attitudes, and attendance positively, instructors with specific students in both conditions tend to rate their PLATO students less favorably on these traits. Replicating this finding, or gathering the further information needed to study it in greater detail, was simply beyond the scope and resources of this project. The questions may have been confusing to the instructors. They may have been unconsciously defending themselves against the results of the evaluation which were not known to them at the time they filled out the questionnaires. They may have applied different criteria for judging the two groups. We present this as an interesting finding which may be of interest to future researchers.

The response to item 7 indicates that these instructors were evenly divided on their perception of which class required more of their time: one-third thought the PLATO class required more time, one-third the non-PLATO class, and one-third saw no difference in time required by the classes.

In item 8, of the instructors who felt there was a difference in the amount of contact they had with their students, the greater percentage (63%) thought they had more contact with their PLATO students. This is further corroboration of the previous finding that PLATO does not have an isolating effect on students. If anything, the effect is in the opposite direction.

Finally, 57% of these instructors reported that at least some of their non-PLATO students complained about not being able to use PLATO. This result is consistent with the responses given by non-PLATO students to the student questionnaire. We are convinced from the information we received from the PLATO site personnel, and from our own independent observations, that few of the non-PLATO students did use PLATO in these courses, a further indication of the cooperation of the instructors in the evaluation effort given their respones to item 10.

6.8 Summary

The results presented in this chapter indicate a favorable impact of the PLATO system on the attitudes of instructors and students in the participating community colleges. Those instructors and students who have used the system are disposed to continue using it. Many of those who have not used it seem to be interested in doing so. A small percentage of students were not favorably disposed to continue using the system.

A reasonable implication of these results appears to be that the general approach used in this implementation and demonstration should be continued. The various components of the system were rated favorably. There are a few weaknesses that have been identified. Use of the system should be voluntary at the student level. More help sequences in the lessons and less stringent answer judging routines would be desirable. By and large, based on the judgments of instructors and students, the strengths appeared to significantly outweigh the weaknesses.

Chapter 7

Behavior

The impact of the PLATO system on student and instructor behavior was evaluated by observing students and instructors in the PLATO laboratory. The information collected in these observations was also used to provide a fuller description of the PLATO implementation and demonstration. The observers noted the numbers of terminals operating, the numbers of students present, the frequencies of system crashes and malfunctioning terminals, as well as actions more directly related to student and instructor behavior such as student discussions, assistance provided by instructors, and indications of enthusiastic and attentive student behavior. Although it is clear that some of this information is not directly related to student behavior, it has been included in this chapter because it was collected in the observations. The data collected yield some information about the behavior of the system itself as well as its impact on the behavior of students and instructors.

7.1 Description of the data

In the Fall 1975 semester, 74 classes across varying subject areas and colleges were observed at different times during the semester. During each observation, several students were selected randomly for more detailed observation. A summary of the classes and students by college and subject area is given in Table 7.1.1. As explained in section 3.2, both objective (how many terminals were used, how many students doubled up at terminals, etc.) and subjective (judgment of enthusiastic, attentive, and frustrated behavior, etc.) data were collected both at the class and individual student level. A preliminary analysis of the data indicated that some behavior changed across time. However, very few of the same classes had been observed over time so that what was judged to be a change in behavior across time may have been due simply to differences in the classes observed. Therefore, the observation plan for the Spring 1976 semester was revised to include the observation of the same classes at three points in time, the beginning, middle, and end of the semester.

Table 7.1.1

Observation Data - Fall 1975

	College				
	I	II	III	IV	Total
A. Classes					
Accounting	2	1	1	-	4
Biology	11	4	7	-	22
Chemistry	2	5	3	9	19
English	6	2	10	6	24
Mathematics	4	-	-	1	5
Other (Economics)	-	-	1	-	1
Total	25	12	22	16	75
B. Students					
Accounting	28	15	22	-	65
Biology	222	58	170	-	450
Chemistry	41	85	66	164	356
English	97	24	148	113	382
Mathematics	74	-	-	24	98
Other (Economics)	-	-	20	-	20
Total	462	182	426	301	1371
C. Individual Students					
Accounting	5	3	2	-	10
Biology	33	10	12	-	55
Chemistry	5	15	8	19	47
English	18	5	28	15	66
Mathematics	12	-	-	2	14
Other (Economics)	-	-	2	-	2
Total	73	33	52	36	194

The general plan for the Spring was to observe approximately 30 classes at each of the three points in time. Because the Fall experience had shown that some instructors postpone and reschedule their laboratory periods, 40 classes were targeted for observation in the first observation period. Some of the PLATO instructors completed their use of the system prior to the third observation period; the evaluators succeeded in collecting complete data for all three observations in 24 classes. An additional 13 classes were observed twice during the semester. A summary of the classes and students observed by college and course is given in Table 7.1.2. A summary of classes by observation periods is given in Table 7.1.3, and a summary of students in each class is given in Table 7.1.4. Copies of the observation instruments are included in the appendix.

7.2 Analysis and results

Data collected by the observers were coded and frequency distributions of counts and ratings were determined for the total sample of classes and students, for each college, for each subject area, and for each of the three observation periods. Although some of the basic data were informative without further analysis (for example, the number of system crashes observed), much of the data could only be interpreted in relation to other data collected. The evaluators attempted to summarize the data in ways that seemed to yield the most information. In some cases, percentages seemed most appropriate. In other cases, means and standard deviations on rating scales were used to summarize the observation data.

General descriptions of the PLATO laboratory and the behaviors of instructors and students were based on the total sample of 100 classes and 291 randomly selected students observed in the Spring semester. Descriptions of changes in behavior over time were based on the 24 classes that were observed at the beginning, middle, and end of the Spring semester.

Table 7.1.2

Observation Data - Spring 1976

A. Classes

	College				
	I	II	III	V	Totals
Accounting	2	-	4	3	9
Biology	12	3	3*	-	18*
Chemistry	3	12	3	-	18
English	19	6	8	16*	49*
Mathematics	-	-	-	8	8
Totals	36	21	17	26	102

B. Students

	I	II	III	V	Totals
Accounting	35	-	88	34	157
Biology	290	38	75*	-	403*
Chemistry	51	185	51	-	287
English	237	77	110	139*	563*
Mathematics	-	-	-	88	88
Totals	613	300	324	261	1498

C. Individual Students

	I	II	III	V	Totals
Accounting	6	-	12	9	27
Biology	36	9	6	-	51
Chemistry	9	36	9	-	54
English	51	18	24	45	138
Mathematics	-	-	-	21	21
Totals	102	63	51	75	291

*Includes one class in which the observation was not completed.

Table 7.1.3

Observation Data - Spring 1976
(By Observation Period)

College	Total	Obs 1	Obs 2	Obs 3	Matched
I	36	13	13	10	10
II	21	8	8	5	5
III	18*	7*	6	5	3
V	27*	11*	10	6	6
Totals	102	39	37	26	24

Subject	Total	Obs 1	Obs 2	Obs 3	Matched
Accounting	9	4	3	2	1
Biology	18*	7*	6	5	4
Chemistry	18	6	6	6	6
English	49*	18*	19	12	12
Mathematics	8	4	3	1	1
Totals	102	39	37	26	24

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*Includes one class in which the observation was not completed.

Table 7.1.4

Observation Data - Spring 1976
(By Students in Classes)

Subject	Obs 1	Obs 2	Obs 3
College I			
Accounting	21	14	-
Biology	31	15	-
	31	30	15
	28	22	20
	18	30	25
	25	-	-
Chemistry	17	19	15
English	-	12	-
	12	8	3
	23	12	10
	21	17	13
	12	10	7
	17	7	6
	25	11	11
College II			
Biology	16	14	8
Chemistry	17	15	10
	20	14	9
	21	17	11
	26	8	17
English	21	10	-
	16	11	-
	14	5	-
College III			
Accounting	33	-	15
	26	14	-
Biology	32*	22	21
Chemistry	21	14	16
English	20	17	12
	13	8	5
	23	12	-
College V			
Accounting	13	11	10
English	-	12	-
	8*	-	-
	12	4	5
	6	5	3
	10	-	-
	14	8	6
	16	14	4
	-	12	-
Mathematics	11	-	-
	9	11	12
	-	12	-
	11	10	-
	12	-	-

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* Observation was not completed.

The observations of two classes listed in Table 7.1.1 were not completed. These two classes have been included in Table 7.1.1 because the instructor and students came to the PLATO laboratory but were not able to use the system. In one of the classes, a system failure occurred at the beginning of the scheduled period. The estimated PLATO "down time" was a half hour. The instructor decided to return to the regular classroom and forego the use of PLATO on that particular day. The other class was not able to use the system because the class file had not yet been entered into the system. In the remaining 100 cases, the planned observations were completed. During these 100 observations, two system "crashes" occurred. One "crash" lasted two minutes and the other occurred at the end of a scheduled period. The projected "down time" in the latter case was not recorded. In summary, three system "crashes" were recorded by the observers in 102 observations. These data give an estimated 3% probability of a system based interruption occurring during prime time use of the PLATO system. This evidence corroborates the information on system reliability published by the CERL staff.

In addition to system "crashes," malfunctioning student terminals were a potential source of disturbance to the optimal utilization of the PLATO system. In the observation component of the evaluation, it was recorded that, at the beginning of the period, (1) all terminals in the PLATO laboratory were operating in 76% of the observations, (2) at least 90% were operating in 91% of the observations, (3) in the remaining 9% of the observations 70% to 90% of the terminals were operating. There was considerable variation across colleges. In College II, all terminals were operating in 95% of the observations, whereas in College V all terminals were operating in only 58% of the observations. In addition to terminals not being operational at the beginning of a period, it was possible for terminals to malfunction during the course of the period. Observers recorded instances of malfunctions serious enough to require the student to move to another terminal. As a percentage of terminals observed, less than 1% of the terminals malfunctioned during the course of the 100 observations. This source of disturbance did not appear to be a serious disruption in the demonstration.

In summary, the mechanical functioning of the PLATO system appeared to be very adequate for the demonstration.

A second source of concern in the demonstration was that ECS constraints would prevent students from receiving individualized instruction. The observers perceived no serious problems related to this concern. In a few instances, authors and students from classes other than the scheduled class were "bumped off" the system if the PLATO activities of the regularly scheduled students required the allocated ECS. There were automatic procedures for this process that appeared to work very well. Although the numbers of students in various lessons at the same time were not quantitatively recorded, the observers periodically checked the site usage and noted considerable variation in lessons being studied. In addition, the use of PLATO during unscheduled periods when students could use the terminals on their own was observed on ten different occasions. During these observations, students from 8 to 12 different courses used the system with no problems due to ECS constraints noted. These observations were not part of the 100 observations in which complete data were collected on classes and students.

Another concern was that the number of student terminals at each site would be inadequate to serve entire classes. Although it has been argued that students working in pairs at terminals might be advantageous under certain circumstances, instructors and students in answering the questionnaire data generally agreed that doubling up of students was not desirable. Such doubling up also resulted in a loss of on-line data for one student and was contrary to the objective of providing individualized instruction. Although there were a few cases in which students were allowed to work in pairs even when other terminals were available, working in pairs generally reflected the absence of free terminals.

In the 100 observations, approximately 8% of the students worked in pairs. The percentage decreased across the semester from 10% in the first observation period to 5% in the third observation period. There was considerable variation across subject areas due to differing class sizes with most doubling up occurring in biology and accounting classes. These data must be interpreted in relation to the overall picture of the demonstration. Although it was necessary for students to work in pairs when the number of terminals was not adequate, in 89 of the classes observed there were adequate numbers of operable terminals available for individual use by students. The number of classes in which the number of students exceeded the number of operable terminals was eight at the beginning of the semester, two in the middle of the semester, and one at the end of the semester. These data were collected systematically at a point 30 minutes after the beginning of the period.

Instructors were present in 97% of the observations. In general, the instructor was available to students for assistance. Most instructors circulated about the laboratory and volunteered assistance to the students. Others tended to observe the students and provide assistance only when such assistance was requested. Assistance was both substantive (dealing with the content of the lesson the student was studying) and mechanical (dealing with the mechanical operation of the PLATO terminal). Assistance with mechanical problems decreased markedly over the course of the semester. Whereas such assistance was provided in 80% of the observations at the beginning of the semester, it was provided in only 8% of the observations at the end of the semester. If the mechanical problem could not be solved by the instructor, the site director or an aide was always present to provide additional help. About half of the instructors used a PLATO terminal for some portion of the scheduled period. Two instructors used the scheduled period to perform activities not related to PLATO, correcting papers or working with students apart from the PLATO terminals. Except for the extent of assistance provided for mechanical problems related to using PLATO, the activities of instructors did not change markedly across the semester.

The site directors and aides in the PLATO laboratories provided substantial assistance to students at the beginning of the semester. Toward the end of the semester, the site staff spent less time assisting students and more time working at free terminals. The responsibilities and activities of the site staffs varied across sites. At some sites, the site personnel provided substantial assistance to authors in programming lessons.

Providing a data-based description of student activities and behavior in the PLATO laboratory is difficult. Observers recorded the number of students present at the beginning of the scheduled class time, the number and time of students who arrived late, the number and time of students who left early, and the number of students who remained at least five minutes beyond the end of the scheduled class time. The general picture that emerges is one of fluidity. In the 100 classes observed, approximately 24% of the students arrived at least five minutes late, approximately 9% left at least five minutes early, and approximately 28% remained working at the PLATO terminals at least five minutes beyond the end of the period. There were instances in which students arrived before the scheduled class time and began working, but these data were not recorded quantitatively across all of the observations. In the absence of comparable data for regular classes at the community colleges, we can only speculate about what these data mean. We think that tardiness was not all that unusual in the community colleges, but we also think that leaving class early and remaining at work beyond the end of the period were unusual. Therefore, we speculate that PLATO provided the student with the opportunity of completing his work before the end of the period and with the corresponding opportunity of continuing his work beyond the end of a regularly scheduled period. Both behaviors were observed and are examples of PLATO impact on student behavior consistent with individuaized instruction. We do not know whether PLATO also tends to increase the tendency of students to come late to class.

During the 100 observations, approximately 200 students who were not in the scheduled classes being observed used PLATO terminals that were free at those times. The observation of ten free periods when no class was scheduled and the PLATO terminals were available to students on a first-come first-served basis indicated that students used PLATO during their free time. The PLATO usage distributions given in Chapter 2 indicated that such extra usage of the system varied greatly across students. In the questionnaire data summarized in Chapter 6, 70% of the students reported that they often continued working on PLATO at the end of the class period and 60% reported that they would use PLATO more if terminals were available. Taken together, this information provides strong evidence that PLATO has a significant impact on the tendency of students to use the PLATO system voluntarily on their own time.

In the PLATO laboratory, students tended to communicate freely both with the instructor and with other students. It was common for students to request assistance from their instructor, from members of the site staff, or from other students. In most of the observations (86%), students engaged in brief verbal interchanges during the class period. Although it was not possible in every instance to ascertain the nature of the communication, the detailed observation of random students indicated that this communication was almost always related to their PLATO instruction. Although it was difficult to summarize these data in a simple measure, it was clear that PLATO did not result in students working in strict isolation from one another.

The observers rated the classes observed on attention to task, attitude toward instruction, the extent of student-student interaction, the extent of lesson access problems, and student facility with the PLATO terminals. Each class was rated on a scale from 0 to 4 as explained in section 3.2. A summary of the ratings is given in Table 7.2.1. The ratings across time are based on observations of the same 24 classes at three points in time. These data indicate that students were generally very attentive and had a very positive attitude toward their instruction throughout the semester. They increased their facility in using the PLATO terminals between the beginning and the middle of the semester although they were generally using the terminals with facility from the start. There was a moderate degree of student-student interaction which decreased slightly during the course of the semester. There were some difficulties in accessing lessons at the beginning of the semester, but these virtually disappeared by the end of the semester.

Table 7.2.1

Class Ratings
Spring 1976

	Beginning of Semester		Middle of Semester		End of Semester	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Student Attention	3.58	.57	3.33	.75	3.38	.75
Student Attitude	3.13	.53	3.25	.60	3.17	.69
Student-Student Interaction	1.50	1.04	1.33	1.28	1.08	1.12
Lesson Access Problems	1.17	1.28	0.50	.57	0.21	.41
Facility in Using Terminals	2.17	1.11	2.79	1.00	2.79	1.08

To provide less global judgments of student behavior, three student terminals in each class were selected at random for a more detailed observation during a five minute period. The three five minute periods were selected at random without replacement. Student terminals were selected at random with replacement. Thus, the same student terminal could be observed more than once, but students at two terminals could not be observed simultaneously.

A total of 291 individual students were observed in the 100 class observations. A few observations were missed due to early dismissal of the class, fire drills, and courtesy in allowing observer time to be coopted by conversations with instructors, site staff, and/or visitors to the laboratory. Ten of the 291 terminals selected at random were used by two students working together. Judgments were made only for the student who was actually operating the PLATO keyboard.

Approximately 13% of the students observed individually used supplementary materials (textbook, notes, slide rule, calculator) while working at the PLATO terminal; 17% of the students requested help from the instructor or a member of the site staff; 7% requested help from a neighboring student; and 9% were interrupted by a neighboring student seeking assistance. These students were rated on scales from 0-4 on such characteristics as facility in using the terminal and levels of attention, enthusiasm, relaxation, activity, confusion, and frustration. Because these results are interesting to examine across time, the results for the 210 observations made in the 24 classes observed three times are summarized in Table 7.2.2.

Table 7.2.2

Individual Student Ratings
Spring 1976

	Beginning of Semester		Middle of Semester		End of Semester	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Facility in Using Terminal	2.60	.87	2.70	.97	2.91	.89
Attention	3.40	.71	3.15	.84	3.34	.84
Enthusiasm	2.66	.83	2.64	.77	2.62	.75
Relaxation	3.36	.74	3.25	.93	3.47	.74
Activity	3.06	.81	3.01	1.04	2.85	.99
Confusion	.74	.89	.54	.80	.59	.97
Frustration	.43	.75	.43	.81	.43	.79

The data in Table 7.2.2 show that students were generally relaxed and attentive in using the system, they showed good facility in using the terminals, they were more enthusiastic than bored, more active than passive, and generally neither confused nor frustrated. Student behavior as reflected in these characteristics did not change significantly across the semester.

7.3 Summary

The results of the observation component of the evaluation indicate that the PLATO system reliably delivered individualized instruction to students in a variety of courses and lessons at the same time within a site. The number of student terminals at each of the various sites was adequate for the demonstration.

Instructors and members of the site staffs played an active role in the PLATO laboratories by providing assistance to students with both mechanical and content related problems. Toward the end of the semester, instructors and site staff members spent a greater proportion of the scheduled class time in using the PLATO terminals themselves.

The students used the PLATO system voluntarily on their own time as well as during their assigned class times. They did not become isolated in using the system but rather interacted considerably with their instructors and with other students while using the system. The students were attentive and showed a positive attitude toward their instruction. They were generally enthusiastic, relaxed, and active in using the system and operated the terminals with facility even at the beginning of the semester. There was little evidence of confusion or frustration.

Chapter 8

Curriculum Development

The development of PLATO instructional materials appropriate for community college students and suitable for community college courses in the five targeted subject areas was a goal of the implementation and demonstration project. Such materials did not exist prior to the implementation and demonstration project. It was anticipated that community college instructors would develop an adequate set of lessons by adapting existing lessons in use by university students and by creating new lessons during the first 18 months of the project (January, 1972-June, 1974). These lessons would provide the necessary core for the start of the first demonstration year and further development would continue during the two demonstration years (September, 1973-June, 1975). This plan was overly optimistic. In June 1973, the demonstration phase was postponed one year as additional staff were employed to prepare more materials and to work with instructors in their efforts to integrate the PLATO materials into their courses.

Although the curriculum development effort differed in the five targeted subject areas, there were common elements that can be treated more generally. In each targeted subject area, there were individual instructors who developed lessons. During the first 18 months, most of the individuals were instructors or graduate students at the University of Illinois. A few community college instructors developed some lessons, primarily in accounting and chemistry. In the 1973-1974 academic year, the curriculum development effort was aimed at organizing existing materials and developing course outlines with suggestions for integrating the available PLATO lessons into specific community college courses. During the two demonstration years (September, 1974-June, 1976), the curriculum development effort continued with groups of instructors in each targeted subject area working together with CERL subject matter coordinators and experienced programmers. Although timing and emphases differed in the five targeted subject areas, the general effort was similar. Lessons were developed by individuals, an attempt was made to organize existing materials for appropriate courses, and teams of instructors in each targeted subject area with support from programmers and resource staff continued the development effort throughout the two demonstration years.

To provide information on the nature and extent of the curriculum development effort, the effort in each targeted subject area will be described separately.

8.1 Accounting

During the development period (January, 1972-June, 1973), an instructor in one of the participating community colleges designed and programmed approximately 20 lessons varying in estimated length from one-half hour to two and a half hours. These lessons were developed for PLATO III and had to be rewritten for PLATO IV before they could be used in the community college demonstration. This instructor, released full time in the 1971-1972 academic year, worked at CERL in Urbana and developed most of the accounting lessons during that time. The same instructor was released one-quarter time during the 1972-1973 academic year to convert the PLATO III lessons to PLATO IV and to serve as a resource person to other interested accounting instructors in the community colleges.

Also during the first 18 month period, an assistant professor of accounting at the University of Illinois and several graduate students developed an additional four or five lessons which were considered appropriate for the community colleges. During the remainder of the project, this assistant professor was responsible for revising the available accounting lessons when student performance data indicated the need for such revisions.

When the targeted date for the start of the first demonstration year was postponed from September, 1973 to September, 1974, the curriculum development effort was focused on formulating outlines for integrating available PLATO lessons into appropriate community college courses.

In accounting, this work was done by several community college instructors with a minimum of CERL assistance. PLATO lessons were reviewed by several accounting instructors and outlines for sequencing the lessons into the introductory accounting course were formulated. Because the same textbook was used in the participating colleges, the PLATO lessons were listed as appropriate for specific chapters of the text thus providing an outline suitable for all colleges.

During the first two and a half years of the project, there were virtually no written materials describing available lessons. One of the more important contributions of the subject matter coordinators who were added to the CERL staff in 1973 and 1974 was the production of catalogues of available lessons in each subject area with descriptions of each lesson and its objectives. These catalogues were updated from time to time during the two demonstration years. In accounting, the most recent catalogue lists 48 lessons with 13 of the lessons developed entirely or in part by community college instructors.

In accounting, the primary curriculum development effort in 1974-1975 was directed toward improving the lessons that had already been developed. This effort was directed by the CERL accounting coordinator using student performance data collected on-line during the demonstration period. In the 1975-1976 academic year, two community college instructors began meeting on a regular basis with a programming specialist to develop new lessons. During the last semester of the second demonstration year, this effort continued without CERL input and resulted in two new accounting lessons: (a) Personal and Dependent Exemptions, and (b) Payroll and Payroll Taxes.

8.2 Biology

During the development period (January, 1972-June, 1973), the primary curriculum development effort was directed by a doctoral candidate in zoology at the University of Illinois who had worked with PLATO for several years, had developed six or seven PLATO lessons, and had worked with a biology professor who had developed an additional six lessons. These lessons had been written on PLATO III for use by

University of Illinois students and had to be rewritten for PLATO IV. Their appropriateness for community college students, however, was questionable. During the summer of 1973, several community college instructors field tested a few of the biology lessons in a summer course in genetics.

During the 1972-1973 academic year, six biology instructors from the participating community colleges enrolled in the CERL-directed University of Illinois extension school course in the use of PLATO. These instructors continued some lesson development in 1973-1974 and began to develop course outlines with suggestions for the integration of PLATO lessons. A serious problem in biology, unlike accounting, was that the biology courses in the participating colleges were quite different from one another. Therefore, course outlines for different biology courses were developed. In August, 1974, a full-time biology coordinator was added to the CERL staff to organize and continue the curriculum development effort. Three additional staff members were added during the two demonstration years.

The curriculum development effort in biology during the two demonstration years (September, 1974-June, 1976) was substantial. The CERL staff produced catalogues of available biology lessons similar to those mentioned in the description of the accounting development effort. Lessons were revised in light of student performance data collected on-line.

A team approach to lesson review, lesson development, and a general curriculum development effort was begun in the 1974-1975 semester. A group of biology instructors, CERL staff, and other community college staff began meeting on a bimonthly basis and increased the frequency of their meetings during the course of the two demonstration years. By the Spring 1976 semester, this group was meeting regularly about every two weeks. A member of the evaluation staff attended all meetings. The group provided a continuing review of lessons under development, identified areas in the curriculum where additional lessons were needed, developed scenarios and designs for new lessons, and developed new lessons usually working in pairs of one instructor and one programmer. By the end of the second demonstration year, between 20 and 30 PLATO lessons were completely or partially developed by this group effort.

8.3 Chemistry

Chemistry was in a somewhat unique position in that one of the participating community college instructors had been working with PLATO since 1967 and had authored 19 PLATO lessons which were considered appropriate for the students at the college where the instructor was employed. In addition, one community college instructor, released full time in 1971-1972 to work at CERL in developing lessons, authored six lessons which were considered appropriate for community college students. Finally, a chemistry professor at the University of Illinois had developed many lessons for university students. It was expected that at least some of these could be modified for community college students. Because of the extent of materials already available, the chemistry curriculum development effort was directed on a part-time basis by an experienced CERL staff member with other responsibilities in the overall PLATO system. In the second demonstration year (1975-1976), a full-time coordinator in chemistry was appointed to the CERL staff.

During the development period (January, 1972-June, 1973), the community college instructor who had been working with PLATO since 1967 had produced an outline by March, 1973, with suggested ways of integrating the available PLATO lessons into a community college introductory chemistry course. During the summer of 1973, this instructor met with five additional community college instructors and a member of the evaluation staff to review suggested outlines for the integration of PLATO lessons into the chemistry courses at other participating colleges. Except for the lack of available terminals, and the fact that one of the participating colleges was moving to a new site, the demonstration in chemistry could have begun in September, 1973.

During the 1973-1974 academic year, the curriculum development effort was primarily directed toward plans for the integration of PLATO lessons into appropriate community college courses. In November, 1973, ten chemistry instructors from the participating community colleges met and discussed their plans for integrating PLATO materials into their courses. It was at this meeting that instructors focused in on the topics that determined the nature and content of the topical tests used in the evaluation.

During the demonstration years (September, 1974-June, 1976), a working group in chemistry similar to the biology group was formed. However, the impetus for this group appeared to come from the Director of the PLATO project in the Chicago Community Colleges rather than from CERL or the previously mentioned instructor who taught at the downstate community college participating in the project. During the 1974-1975 academic year, this group designed ten new chemistry lessons for the introductory chemistry course. These lessons were coded and programmed during the summer of 1975. The curriculum development effort in the second demonstration year was focused on the development of an organized PLATO curriculum for the introductory chemistry courses. Lessons were reviewed and discussed, and a curriculum of PLATO lessons was developed and endorsed by the group. The published curriculum was intended especially for inexperienced users of the PLATO system.

8.4 English

During the development period (January, 1972-June, 1973), the curriculum development effort in English lacked cohesion. Whereas in accounting, biology, and chemistry, fairly well defined introductory courses were identified so that the appropriateness of PLATO lessons could be judged, in English there was considerable confusion about the content of a basic course in English. Three community college instructors worked full time at CERL in the 1971-1972 academic year and produced several PLATO lessons. Two of these instructors taught or supervised GED programs. One was an English instructor. Two other community college instructors received released time during the development period and produced more than 20 lessons, most of them short, about 5-10 minutes in length. In reporting on the extent of lesson development in 1973, CERL referred to most of these as mini-lessons. Further confusion resulted from the inclusion of reading in this targeted area. In projecting plans for the September, 1973 demonstration, ten reading comprehension lessons were listed as being prepared for the first demonstration year. No attempt had been made at that time to develop course outlines and plan for integrating PLATO lessons into appropriate courses as had been done in accounting, biology, and chemistry.

During the 1973-1974 academic year, a full-time CERL coordinator was appointed to organize the curriculum development effort in English. Four additional staff members were added at a later point although their duties were not strictly limited to the English curriculum development effort. The English coordinator assumed responsibility for the general coordination of the community college project and one member of the English staff assisted instructors in the field in areas other than English. Nevertheless, in the Fall of 1973, a major commitment was made by CERL to the area of English.

During the 1973-1974 academic year, available PLATO lessons were organized in two ways. A catalogue of lessons with descriptive information was prepared. Lessons were categorized as follows: capitalization, composition, editing, grammar, poetry, punctuation, research, spelling, vocabulary, and word usage. In January, 1974, lessons more closely related to language arts skills were organized into a routing system. In general, the routing system contained four categories of lessons: grammar, punctuation, spelling, and word usage. These were further divided into topics. By the end of the second demonstration year, the routing system contained 54 distinct topics with the capability of providing a short diagnostic test for each topic. Instructors selected those topics they considered relevant to their courses. Students who did not reach a specified criterion on the diagnostic test for a given topic received instruction on that topic. Instructors who did not wish to use the routing system could set up indices of lessons as was done in the other subject areas.

During the two demonstration years (September, 1974-June, 1976), curriculum development efforts continued on two fronts. The CERL English staff continued its development of the Language Arts Routing System, and a group of English instructors under the direction of one of the community college instructors continued reviewing existing lessons, suggested revisions, identified areas where new lessons were needed, designed, and developed lessons. CERL staff members regularly attended and participated in the group meetings. Community college instructors, on their part, reviewed the diagnostic questions and the lessons in the routing system and suggested ways of improving the system. During the Spring 1975 semester, participating instructors agreed to focus the curriculum development effort on the identification of those skills needed by students to successfully complete their first composition course. It was agreed that such an effort would provide the basis for determining what additional lessons were most critically needed.

Because lessons were frequently reviewed and revised during the PLATO implementation and demonstration project, it was not always possible to determine when lessons were considered completed. However, unlike the accounting, biology, and chemistry areas, virtually all of the English lessons in the project were developed by community college instructors or the CERL staff directly involved in the project. In the most recent catalogue of English lessons, more than 100 lessons with accompanying descriptive information are listed. Sixty-five of these lessons are contained in the Language Arts Routing System.

8.5 Mathematics

During the development period (January, 1972-June, 1973), three community college instructors who worked full time at CERL during the 1971-1972 academic year produced approximately 15 math lessons considered appropriate for community college students. Ten additional lessons were produced by members of the CERL staff. Course outlines of the basic mathematics courses and lists of texts used were obtained from the participating colleges. Although some materials were produced to indicate where PLATO lessons might be used in some courses, there was little work done during this period to develop outlines for integrating PLATO materials into community college courses with the mathematics instructors in the colleges. The development effort was focused primarily on the development of lessons by individual authors.

In November, 1973, it was projected that the available mathematics lessons were appropriate for use in classes in GED, Basic Mathematics, Algebra, Technical Mathematics, and Trigonometry. A coordinator for mathematics was added to the CERL staff to direct the curriculum development effort. During the 1973-1974 academic year, one mathematics instructor produced a plan for integrating available PLATO lessons into a Fundamentals of Mathematics course.

During the demonstration period (September, 1974-June, 1976), a mathematics group was formed to review and develop lessons. The members of this group, who were instructors, PLATO site coordinators, and CERL staff, continued to work on lessons independently and developed more than 40 lessons during the demonstration years. The curriculum development effort was also focused on outlining an adult education course in basic mathematics to be presented totally on PLATO. During the 1975-1976 academic year, the CERL mathematics staff members developed a student guide for PLATO for the Fundamentals of Mathematics course.

8.6 Summary

The development of PLATO curriculum materials proved to be more difficult than had been anticipated. As a result, the demonstration period of the PLATO implementation and demonstration project was postponed for one year while additional CERL staff were added to the project to develop more PLATO lessons for the community college project.

During the two year demonstration period, the curriculum effort was continued and community college instructors participated in developing lessons. However, few lessons were entirely developed by instructors working alone. In general, instructors worked in groups in designing the lessons, and the lessons were then programmed for PLATO IV by additional community college and CERL staff members.

Although the extent and the nature of the curriculum development efforts were different in the five subject areas, there was significant instructor involvement in each subject area. The evidence that lessons were developed as had been projected, and that the development was a cooperative effort of CERL staff members and community college instructors, was strong and convincing. Lists of lessons developed in each subject area are described in catalogues which were produced and updated during the demonstration period.

Chapter 9

Miscellaneous Outcomes

There were a number of outcomes of the PLATO implementation and demonstration which were not measureable in any standard way but for which evidence can be given. Some of these outcomes--communication between authors and instructors, training of instructors by University of Illinois extension courses--were intended; others--special studies by instructors and/or groups of instructors in the colleges--were not. The evaluators attempted to identify these outcomes and have obtained copies of descriptive reports and papers from a number of sources, i.e., CERL staff, site coordinators, and individual instructors.

9.1 Commitment of the participating institutions

A substantial commitment to the PLATO project was made by the participating institutions. In two colleges, separate rooms for the terminals were provided; in two other colleges, substantial portions of the Learning Resources Laboratory were set aside for PLATO use; and, in one college, a section of the college library was given over to PLATO. The colleges provided a site director and three or four support staff for each PLATO site. In the Chicago Community Colleges, an overall director of the PLATO project was appointed by the Chicago Community College system. Several instructors in the participating colleges received released time to develop course outlines and lessons appropriate for community college students. Administrators supported the PLATO implementation by providing encouragement to the PLATO supervisory staff and by providing the evaluators access to the central records system. Perhaps the most convincing evidence of the colleges' commitment was the continuing use of the PLATO system during the 1976-1977 school year without the financial support of the National Science Foundation. In visiting the colleges at the beginning of the 1976-1977 academic year, the evaluators found the system functioning much the same as during the two demonstration years (1974-1976). Instructors appeared to be using the PLATO system earlier in their courses. In addition, groups of instructors were continuing the curriculum development effort described in Chapter 8.

9.2 Independence of the colleges from CERL support staff

An objective of the developers in the second year of the demonstration period was to facilitate the independent operation of the PLATO system by the participating institutions. During the Spring 1976 semester, site directors began setting up the required file spaces for courses and entering and maintaining the courses for instructors. In the Fall 1976 semester, the management of file space for courses, student records, and data files were handled independently and successfully by the community colleges staff. It was necessary to transfer file space from one college to another. The evaluators observed this transfer being handled quickly and efficiently during the follow-up visit to the sites in September, 1976. In addition, two community college staff members had assumed responsibility for the operation of the Language Arts Router System used in the community college English courses.

9.3 Communication across institutions

There was considerable evidence of communication across institutions. Announcements of meetings and corresponding agenda were communicated to instructors by one of several "notes" packages available on the PLATO system. Instructors reviewed lessons on the system and wrote notes to the appropriate authors, or left notes in a general notes file.

During the PLATO laboratory observations, the evaluators observed considerable on-line communication between instructors and members of the CERL staff. In a few cases, the evaluators observed immediate results of such communication. During one observation period, students experienced a mechanical difficulty in using a lesson. The instructor communicated with a member of the CERL staff. Students were asked to sign-out of that lesson temporarily, and an adjustment was made in the lesson within a few minutes. Students returned to the lesson and proceeded without difficulty. The evaluators also observed an on-line communication to a site director from an instructor who had not anticipated using PLATO on a given day. Within minutes, a file space and a course index was set up for immediate use by that instructor.

On occasion, the evaluators noted an experienced programmer monitoring the programming effort of a colleague and providing on-line assistance. Instructors could monitor the work of a specific student on a PLATO terminal and communicate with the student at the same time on-line.

9.4 CERL-directed extension courses

During the PLATO project, extension courses in instructional development, instructor use of the PLATO system, and lesson authoring were taught by members of the CERL staff. Although detailed information was not collected from all participants in these courses, 31 instructors who participated in the evaluation rated these courses as very helpful (17) or moderately helpful (14). No instructor rated the courses as "not helpful at all," a possible option. These courses were not limited to instructors from the five participating community colleges. Instructors from other colleges attended. In observing the lesson development groups described in Chapter 8, it was noted that one of the instructors from a non-participating college was frequently present at the meetings, and contributed substantially to the discussions. A set of papers produced in several of the courses was provided to the evaluators as an indication of the work performed by participants in these courses. Although these papers are not a measure in any strict sense, they are an indication of the variety of instructors who were exposed to PLATO during the project. In discussing how they might use PLATO, instructors produced plans for usage in such disparate curricular areas as shorthand, typewriting, office management, library usage, reading, data processing, physics, and use of office machines.

9.5 Usage of PLATO in areas other than the five targeted subject areas

The PLATO system was used in a number of subjects outside the five targeted subject areas of accounting, biology, chemistry, English, and mathematics. Although these courses were not within the focus of the evaluation design, they provide evidence of the applicability of PLATO in other areas. In general, the impetus for this usage came from individual instructors. In Table 9.5.1, a summary of this "extra" usage is given.

Table 9.5.1

Use of The PLATO System in non-Targeted Areas
Fall 1975

Subject	# of Students	Hours of Usage
Data Processing	269	1,122
Economics	113	414
Electronics	26	79
Engineering	77	319
French	19	18
Library Science	40	116
Music	37	45
Nursing	78	221
Social Science	109	132
Spanish	94	146

Table 9.5.1 summarizes the usage only for students with individual sign-ons. Usage by students in demonstration lessons or in lessons using a common multiple sign-on have not been summarized in the project.

9.6 Studies and reports

Another outcome of the PLATO implementation and demonstration was the production of small studies and reports by individual instructors, groups of instructors, and members of the CERL staff. A brief description of those studies and reports about which the evaluators have received information or copies is given in this section. There may have been other studies of which the evaluators were not aware. No attempt was made to evaluate these studies. They stand on their own merits and are presented here only as evidence of events which can be directly attributed to the PLATO implementation and demonstration.

Two accounting instructors performed comparative studies in their respective colleges of PLATO and non-PLATO students. One of the reports was the result of a joint effort between a community college instructor and an associate professor at the University of Illinois. In general, both studies examined achievement and attrition in PLATO and non-PLATO classes in accounting. One study showed no effects and the other showed strong instructor effects which made interpretation of results difficult.

Two biology instructors designed studies in connection with their doctoral programs. One study was designed to investigate the predictive validity of personality traits on success in a PLATO course. The other was designed to compare achievement of PLATO and non-PLATO students using such covariates as a biology pretest, a test of scientific attitudes, the Black Intelligence Test of Cultural Homogeneity, and a variety of biographical information. Proposals describing these studies were provided to the evaluators.

An additional biology instructor with experience in using PLATO developed an individualized program outline for an introductory biology course which incorporated a series of PLATO lessons, other audiovisual materials (films and filmstrips), and a plan for a series of sequential quizzes to implement a "mastery" approach for students in the course. In general, the program outline included a description of the lesson, its objectives, the readings, audiovisual, and PLATO materials appropriate for the lesson, and a series of comments on each of 30 planned lessons.

One chemistry instructor investigated the predictive validity of cognitive styles on achievement in several PLATO chemistry courses. The data for this study were collected during the demonstration years, but no report or results were available at the end of the demonstration period. Another chemistry instructor compared achievement in one PLATO and one non-PLATO class for subgroups of items on the ETS topical tests. This instructor also tried to obtain information from students who dropped out of the PLATO and non-PLATO classes. Obtaining this information proved to be difficult; but based on information that was obtained, PLATO had no effect on student dripout behavior. Reasons given for dropping out were primarily based on personal problems or dissatisfaction with the instructor. A third chemistry instructor compared the achievement of PLATO students with non-PLATO students on course material presented on PLATO. Students who received the PLATO instruction scored higher on a related test than students who received the course material in a lecture class format.

One English instructor published a report on a comparative study of two PLATO and two non-PLATO English classes. The instructor identified specific errors on themes written by students and examined the differential effects of PLATO on categories of errors. Another English instructor kept daily records of three classes, two using PLATO and one not using PLATO. The two PLATO classes differed in that one received additional explanatory notes for home study and one did not. Achievement and attrition for the three classes were compared. A formal report was not produced prior to the end of the demonstration period.

A special study of voluntary usage of PLATO was carried out by the CERL English staff at one of the participating community colleges. Before being assigned to classes, 1,259 entering students were required to take a four week course in grammar review. These students were informed that 25 lessons appropriate for grammar review were available on PLATO, and they were encouraged to use them on their own time. Approximately 10% of the students used some of the lessons. A report examining the effects of the PLATO usage on the eventual placement of the students and the attitudes of the students was published by the CERL staff.

In mathematics, the CERL mathematics group examined the effects of PLATO instruction on achievement in one area of mathematics in an intensive three week implementation during which students received all of their instruction on PLATO. Pretests and posttests were administered to several PLATO and non-PLATO classes in this effort to assess PLATO's impact in the focused area. A report on the results of this effort is being prepared by the CERL staff.

One mathematics instructor compared the achievement of two classes, one PLATO and one non-PLATO, on a restricted topic with the PLATO students receiving all instruction on the topic on the student PLATO terminals. Initial differences between the two classes were not significant based on the instructor's pretest. Posttest differences for the two classes were not significant. This instructor produced a formal report showing that projected times for lesson completion were substantially underestimated and that attendance in the non-PLATO class was better than that in the PLATO class.

Periodic reports were produced by community college administrators summarizing strengths and weaknesses of the PLATO system as perceived by supervisory personnel in the colleges. In general, the perceptions published in these reports have been corroborated by the information given by the evaluators in this report. The primary strength of the system noted in these reports was the delivery of instruction at the individual student level. Other strengths mentioned were the increasing reliability of the PLATO system during the demonstration and the increasing availability of ECS which allowed the accommodation of many lessons at the site at the same time. Weaknesses mentioned included insufficient numbers of terminals to allow all students to work individually and the time and effort required to design and program the PLATO lessons. In colleges in which the PLATO laboratory was located in the Learning Resources Laboratory, internal reports by the colleges indicate that PLATO use accounted for a majority of the time spent by students in the Learning Resources Laboratories.

Finally, the existence of the PLATO system in the community colleges has provided the basis for the generation of proposals for additional uses of the system. Papers describing the use of the PLATO system as a medium for testing and record keeping for students participating in mastery learning courses and as the basis for a learning system for disadvantaged students in G.E.D. programs have been prepared by community college supervisory personnel and shared with the evaluators.

9.7 Summary

As a result of the implementation and demonstration of the PLATO system in the community colleges, the participating colleges committed some portion of their own resources to supplement funding provided by the National Science Foundation. The colleges gained considerable expertise in managing the PLATO system and were able to continue using the system independently of the CERL support provided during the demonstration period. The PLATO system was used as a communication medium between instructors in different community colleges and between community college instructors and University staff. Community college instructors participated in University extension courses related to the use of the PLATO system.

Although the demonstration was focused on the five targeted subject areas of accounting, biology, chemistry, English, and mathematics, students in ten other subject areas used PLATO for some of their instruction. The system also provided the opportunity for, and was used by, participating instructors to perform small research studies on their own.

These outcomes can be considered as side-effects of the implementation and demonstration. They are included in this chapter in an attempt to be as inclusive as possible in assessing the educational effectiveness of the PLATO computer-based education system.

Chapter 10

Summary and Conclusions

PLATO (Programmed Logic for Automatic Teaching Operations) is an acronym used to describe a computer-based education system developed at the Computer-based Education Research Laboratory (CERL) in Urbana, Illinois. Development of the system began in the early 1960's and progressed through four stages. The fourth stage, PLATO IV, was designed to operate with 4,000 student terminals at varying distances from the central computer at CERL. Because initial assumptions were not met when the system was actually implemented, the system has operated with approximately 1,000 student terminals spread throughout the United States with a few in Canada and Europe.

Each student terminal consists primarily of a plasma panel on which instruction is delivered to the student and a keyset by which the student can interact with the system and the instruction being delivered. The aim of the system is to provide individualized instruction to each student.

During the period from January, 1972 through June, 1976, the PLATO system was implemented and demonstrated in a number of elementary schools, community colleges, military bases, and the University of Illinois. This report provides a description of the implementation and demonstration at the community college level and an evaluation of the educational effectiveness of the PLATO system in terms of its impact on participating students, instructors, and colleges.

10.1 Description of the implementation and demonstration

During the period from January, 1972 through August, 1974, student terminals were installed in five community colleges. The terminals were set up in separate areas of the colleges designated as PLATO sites or laboratories. Although it was intended that students would receive individualized instruction, it was also intended that most of the usage of the system would be scheduled for class sized units.

At the beginning of the implementation period (January, 1972-August, 1974), there was little instructional material available on the PLATO system that was appropriate for community college students in the five targeted subject areas of the project. During the implementation period, additional instructional materials were developed in these five areas: accounting, biology, chemistry, English, and mathematics. The development of these instructional materials, in units ordinarily referred to as PLATO lessons, was a more difficult task than had initially been anticipated by the developers. It was projected that community college instructors would learn the programming language (TUTOR) easily and develop their own lessons for their courses. Experience soon demonstrated that community college instructors would not develop an adequate supply of lessons for a demonstration period to begin in September, 1973, as had been projected originally. Additional funding was provided to the implementation and demonstration project to employ additional staff to develop more PLATO lessons in the five targeted subject areas and to provide the necessary liaison with community college instructors in preparing for and carrying out the demonstration.

By August, 1974, an initial core of lessons in the five targeted subject areas had been developed, plans for integrating PLATO lessons into appropriate college courses had been formed, staff had been assigned by the community colleges to the PLATO sites to handle scheduling and provide assistance to instructors, and a group of instructors in each college had been identified as willing to use the PLATO materials in their courses.

The demonstration period began in September, 1974. It had been projected initially that 200 to 300 students in each of the five subject areas would receive PLATO instruction with each subject area represented in at least three colleges. The usage in each of the four semesters of the two demonstration years greatly exceeded the initial projections. However, the average amount of time spent by students in using PLATO was less than had been originally projected. The initial projection was that students would receive about one-third of their instruction on PLATO. Very few instructors used PLATO that extensively. There was wide variation in the extent of usage across colleges, courses, classes, and individual students. No PLATO curriculum was prescribed for any particular course. Instructors were free to use the system as much as or as little as they desired. Instructors exercised this freedom.

In the first demonstration year, PLATO was used in many different courses in the five targeted subject areas. In many instances, instructors were still becoming familiar with the available PLATO lessons and used PLATO to a small extent. By the second semester of the first demonstration year, it was possible to identify rather accurately those courses in which sizable numbers of students were using PLATO - the courses that would be most appropriate for evaluating the impact of PLATO on student attrition, achievement, and attitudes. However, even in the targeted courses, there was wide variation in the amount of time spent using PLATO across the sections in each course and even across students within the same class. This situation was consistent with the general aim of providing individualized instruction, but it prevented any pre-treatment identification of differing modes of implementing the PLATO system across students and classes. In large part, the treatment received by each student was unique.

Therefore, in designing the evaluation, treatment classes were considered as those classes in which PLATO was used in whatever way the instructors and students actually used it; comparison classes were classes in which PLATO was not used. This approach to the evaluation seemed appropriate in this real world implementation and demonstration. Some flexibility remained for post-hoc analyses of effects of different treatments if the data revealed distinguishable categories of treatment. In general, however, the evaluation was designed to be responsive and non-reactive. The only interference by the evaluators was in collecting data from both PLATO and non-PLATO classes, the observation of no more than three PLATO sessions in any one class, and the attempt to build in some control over instructor differences across conditions by requesting participating PLATO users to teach some of their sections without using PLATO.

In general, it seems fair to conclude that the implementation and demonstration of the PLATO system in the community colleges was accomplished in accordance with the original intentions and projections of the developers. The hardware and communication system proved to be reliable. System crashes and malfunctioning terminals were rare and considered only as minor problems by instructors and students. In observing PLATO classes, the independent observers reached this same conclusion. The participating instructors were able to set up indices of lessons or use a special routing system in English to provide instruction for their students. Instructors and students generally regarded the lessons as appropriate for their instruction. There were few instances when students were not able to access a desired lesson. The system, while supporting 1,000 terminals, was able to satisfy the demands of many students studying different lessons at the same time. Based on the observations of the evaluators, the students did use the system in an interactive manner. Students generally liked the fact that they could interact with the instructional materials and receive help when they needed it although there was a need indicated for additional help in some lessons.

For the reader who is interested in knowing whether a large computer-based education system like PLATO with terminals at varying distances from the central computer can work well as a medium for the delivery of interactive instructional materials to students, the answer is a definite yes based on this implementation and demonstration. The same medium also provided the opportunity for, and was used extensively as, a communication medium between instructors and support staff at the central computer facilities, and between instructors at different local sites. And, the same medium provided the opportunity for, and was used extensively as, an authoring medium for the design and programming of instructional materials with virtually immediate feedback of the material in a student mode for try-out and revision.

Based on this implementation and demonstration, this large computer-based education system, PLATO, worked well as a medium for the delivery of interactive instructional materials to students at terminals at varying distances from the central computer.

10.2 Design of the evaluation

The first major task in the evaluation, after potential courses had been identified, was to develop valid assessment instruments for the evaluation. Curriculum outlines were obtained for the targeted courses and studied by Educational Testing Service specialists in accounting, biology, chemistry, English, and mathematics. The ETS subject area specialists then met with members of the departments in the participating colleges and formulated specifications for pretests and posttests. Six pretests, two in biology and one in each of the other subject areas, were developed. The curricula for courses in the same targeted subject area differed from college to college. In order to insure the validity of the posttests and the subsequent evaluation, ETS tailored the posttests to each college in all subject areas except English. In English, instructors agreed on a common posttest across the participating colleges. In chemistry, instructors preferred topical tests to be administered at various stages during the semester. In the other three subject areas, posttests tailored to each course in each college were developed. The posttests were common across the classes within each course. In all, 41 separate tests were developed and field-tested in the first demonstration year. These were revised at the end of the first demonstration year and administered in the evaluation during the second demonstration year.

In the area of attitude assessment, pretreatment and post-treatment questionnaires were developed for students. Members of the development staff and instructors in the colleges assisted in the development of these instruments. The student questionnaires were field-tested in the first demonstration year and revised for use in the evaluation in the second demonstration year.

Based on interviews with the developers and instructors, and on observations of the PLATO system during the first demonstration year, the evaluators developed three instructor questionnaires for assessing the impact of the PLATO system on instructors. Newly developed assessment instruments were not required for studying the impact of PLATO on student attrition.

A comprehensive observation instrument was constructed for the collection of data on the activities and behavior of students, instructors, and personnel in the PLATO sessions. This instrument was also based on interviews with the development staff and the participating instructors as well as on observations of the PLATO system during the first demonstration year.

Plans were also formulated for collecting information about the curriculum development effort of the project. These plans included attending various staff meetings and informally interviewing instructors and other community college and development staff. Virtually all meetings related to this component were attended by an ETS staff member and minutes of the proceedings were recorded. Finally, the evaluation plan included the collection of information on side-effects and miscellaneous outcomes of the implementation and demonstration by requesting copies of all reports, minutes, and memoranda circulated by developers and community college staff. A great deal of personal contact with the participating instructors was a final source of information on unanticipated outcomes.

In order to implement the basic design for the collection of comparative data in the areas of attrition, achievement, and attitudes, instructors who used the PLATO system during the first demonstration year were invited to form the basis for a balanced design. Such a design required that the same instructor teach both a PLATO and a non-PLATO class whenever that was possible. Many instructors agreed to cooperate in this if it could be worked out within the constraints of each department. Departmental chairpersons in each participating college were also asked to cooperate in implementing the design by scheduling instructors appropriately. The tentative design was revised continually until registration of students determined the actual number of sections available in each course and teaching assignments had been firmly scheduled. This approach resulted in a relatively powerful "yoked" design being implemented. The design was "yoked" in the sense that many instructors were identical across the treatment and control conditions thus providing some control over instructor effects. When it was not possible to obtain comparison classes with identical instructors, other non-PLATO instructors were asked to participate in the evaluation as control classes.

The basic designs implemented in the Fall 1975 and the Spring 1976 semesters, Tables 3.1.1 and 3.1.2, are reprinted in this chapter as Tables 10.2.1 and 10.2.2. In the Fall 1975 semester, 62 instructors and 107 classes participated in the evaluation. In the Spring 1976 semester, 34 instructors and 59 classes participated in the evaluation. In the Fall semester, there were 19 potential populations to be studied. In 13 populations (all except English), distinct posttests had been developed to insure valid assessment of achievement. In English, a common posttest was used across all courses and colleges, and later analyses showed that these populations could be pooled. In the second semester, there were 13 potential populations to be studied. Later analyses again showed that the English populations could be pooled. In spite of the pressure to optimize the usage of the PLATO system during the course of the project, these designs were maintained during the evaluation, an indication of the excellent cooperation of the community college personnel in carrying out the evaluation.

The analysis strategies employed in the evaluation consisted primarily of fitting a mathematical model to the empirical data and estimating the effect of PLATO on the dependent variable (attrition, achievement) with initial student ability, instructor effects, and college effects taken into account when appropriate. The analysis strategies included a study of interaction effects and provided the capability of replicating effects across semesters and verifying effects on identical instructors.

Table 10.2.1

Evaluation Design
Fall 1975

Course	College I		College II		College III		College IV	
	P	NP	P	NP	P	NP	P	NP
Business 101	A1	A2	B1	B1	C1	C1		
					C2	C3		
					C2	C4		
					C2			
Biology 101,111	D1	D1	F1	F1				
	D2	D7	F1	F1				
	D3	D8						
	D3	D9						
	D4							
	D5							
	D6							
Biology 102,112	E1	E4			G1	G1		
	E2	E4			G1	G1		
	E3				G2	G2		
					G3	G3		
Chemistry 101,121	P1	P1	Q1	Q1	U1	U1	V1	V1
			Q2	Q2	U2		V2	V2
			Q3				V3	V3
Chemistry 201			R1	R1				
			R2					
			R3					
English 100	H1	H1			L1	L1		
	H2	H2			L1	L2		
	H3	H3			L3	L3		
	H4	H5				L2		
English 101	I1	I1	K1	K1	M1	M1	N1	N1
	I2	I2	K2	K2	M2	M2	N1	
	I3	I3	K3	K3		M2		
		I4	K4	K1		M3		
		I4	K4	K5				
		I5						
Math 111	O1	O1						
	O2	O3						

Table 10.2.2

Evaluation Design
Spring 1976

	College I		College II		College III	
Course	P	NP	P	NP	P	NP
Business 101	A1	A2			C1	C1
					C5	C5
Biology 101,111	D5	D7				
	D6	D9				
	D8					
Biology 102,112	E6	E4	F1	F1	G1	G1
	E7	E4		F1	G1	
Chemistry 121			Q2	Q2	U1	
			Q1			
			Q4			
			Q5			
English 100	H1	H1			L3	L3
	H2	H2				
	H3	H3				
	H4	H5				
English 101	I1	I1	K2	K2	M1	M1
	I2	I2	K2	K2		
	I3	I3	K6	K6		
	I6	I6				
	I2					
	I6					
Math 111	01	01				
	04	04				

In the area of attitude assessment, factor analyses of the attitude data showed that the construction of attitude scales was not justified by the empirical data. Therefore, the PLATO and non-PLATO results were analyzed at the item level. In addition to comparative data, descriptive data were also collected on PLATO and non-PLATO students. Descriptive analyses were used to analyze and summarize these data.

The data collected in observing PLATO classes, in attending meetings, and in personal contacts with development and community college staff were summarized descriptively and anecdotally as appropriate.

In summary, the evaluation design was implemented, reliable and valid data were collected, and the mathematical model and analysis strategies worked well in fitting the data and providing interpretable results which are summarized in the following sections.

10.3 Impact of the PLATO system on students

Based on the analyses of data collected in 162 classes across the five targeted subject areas of accounting, biology, chemistry, English, and mathematics, in four community colleges, and in the two semesters (Fall 1975 and Spring 1976), the PLATO system had no effect on student attrition. Estimates of the impact of PLATO in 32 populations resulted in 18 estimates in the positive direction and 14 in the negative direction. Of the 32 estimates, five were significant ($p < .05$), four in the positive direction and one in the negative direction. One of the significant effects disappeared when the yoked nature of the design was used to check the effect for identical instructors across the treatment and control conditions. Three of the effects were completely confounded with instructor effects and, in view of the overall results, could be readily attributed to instructor differences. The remaining significant result was verified for identical instructors using the yoked nature of the design. Thus, a general conclusion of no consistent effect on attrition was well supported by the data.

In the outcome area of student achievement, PLATO effects were estimated in 23 populations. Of the 23 estimates, 11 were in the positive direction and 12 in the negative direction. Five estimates were significant (p < .05), four in the positive direction and one in the negative direction. None of these effects was replicated across semesters. In two cases, the effects were significantly reduced when the yoked nature of the design was used to verify the effects for identical instructors across the treatment and control conditions. In two additional cases (both positive), PLATO and instructor effects were completely confounded. It was not possible therefore to verify effects with identical instructors. In light of the overall evaluation, it seems plausible to consider these results as due to instructor differences. In one case, a negative PLATO effect was found in one population with only one instructor teaching both PLATO and non-PLATO students. This effect therefore could not be further verified within the population.

In light of the overall evaluation, it can be concluded that PLATO had no significant impact on student achievement in this implementation and demonstration.

The impact of the PLATO system on student attitudes was a generally favorable one. In comparing PLATO and non-PLATO students, the PLATO students showed significantly more favorable attitudes toward computers and computer-assisted instruction than non-PLATO students. However, these attitude differences were not reflected in other areas of comparison. Large, and approximately equal, percentages of PLATO and non-PLATO students felt challenged to do their best work, thought that they received individual attention, felt free to ask questions and express opinions, often discussed their course material with other students, did not find it difficult to get help when they didn't understand the material in their course, and would recommend their respective courses to their friends. These results tend to disconfirm some common belief stereotypes about computer-assisted instruction, but they also show that PLATO and non-PLATO students did not differ much in areas other than those related specifically to computer-assisted instruction.

Based on responses of PLATO students in the evaluation, students who used the PLATO system generally viewed the various characteristics of the system favorably. About half the students thought that course material presented on PLATO helped them learn better than course material presented in class lectures. Large percentages of the students (70%-90%) continued their instruction on PLATO beyond the end of the class period, liked the fact that they could make mistakes without embarrassment, thought that PLATO made helpful comments on their work, thought that PLATO made good use of examples and illustrations, liked the fact that they could take part in their instruction at each step in the lesson, and expressed the desire to take another course using PLATO. Very large percentages (88%) disagreed that using PLATO was dehumanizing or boring. Of course, there is a danger that these percentages are inflated by a halo effect. But they are not reflections of a simplistic devotion to PLATO. A very large percentage of students (83%) stated that they would not want their whole course taught on PLATO. This response shows some discrimination on the part of the students. In addition, these favorable attitudes were corroborated by the observations of the PLATO laboratory sessions by the evaluators.

Based on the observation of some 2,800 students in 177 PLATO laboratory sessions, the evaluators have corroborated many of the conclusions drawn from the self-report data provided by students. Instructors were present in 97% of the observations and generally circulated about the laboratory providing assistance to students. Other site personnel provided assistance to students especially at the beginning of the semester. Thus, students were not isolated from human contact and were able to request and receive help very readily. Students tended to interact with each other as well as with the PLATO system. They were generally very attentive to their work, used the PLATO terminals with facility, were relaxed and enthusiastic, were active rather than passive in their interacting with the PLATO system, and were generally neither confused nor frustrated.

Based on responses of non-PLATO students in the evaluation, a large percentage of the students (80%) knew about the PLATO terminals, had been shown how the terminals worked (48%), and had discussed PLATO with other students and their instructors (52%). A majority of the students (54%) stated that they would like to take a course in the next semester using PLATO. These results indicate the desire of many students to use PLATO if the opportunity is presented.

In assessing the impact of PLATO on students, both comparative and descriptive data have been used. In the areas of attrition and achievement, data on both PLATO and non-PLATO students were collected and compared within the context of a partially-balanced evaluation design. No evidence of a significant impact of PLATO on student attrition or achievement was found. In view of the large number of students across five targeted subject areas, four colleges, and two semesters who participated in the evaluation, it seems reasonable to conclude that the search was adequate and that in this implementation and demonstration PLATO had no effect on student achievement or attrition.

The PLATO system did have a significant positive impact on student attitudes toward computers and computer-assisted instruction. Based on comparative data, PLATO did not have a significant impact on more general attitudes of students toward their instructional experience. Based on descriptive data, the PLATO students viewed their PLATO experience favorably and this favorable response was reflected in their enthusiastic and diligent behavior in the PLATO laboratory as observed by the evaluators.

10.4 Impact of the PLATO system on instructors

Based on the instructor questionnaires completed, the observations of the evaluators, the continuing usage of the PLATO system, and personal contacts of the evaluators with instructors in meetings, workshops, correspondence, and personal conversations, the impact of the PLATO system on instructors was a generally favorable one. Although most (78%) instructors did not perceive the use of PLATO as leading to a decrease in their workload, and a third (33%) thought that using PLATO actually increased their workload, the vast majority (88%) of the instructors intended to definitely or probably continue using PLATO in their courses. More than half of the instructors (59%) expressed their interest in using PLATO more if more lessons and terminals were available. Many (43%) instructors designed one or more PLATO lessons. A sizable number (29%) programmed at least one lesson. Some instructors (9%) designed eight or more lessons, and some (6%) programmed eight or more lessons. Thus, users of the system did participate in the curriculum development effort as projected by the developers in their initial plans.

The participating instructors viewed the various components of the PLATO computer-based education system favorably. The vast majority (72%-86%) judged the number and content of the PLATO lessons, the clarity of the materials presented, and the use of examples and illustrations in the PLATO lessons to be adequate or very adequate for their students. They did not perceive the PLATO system as having an isolating effect on students. Although 47% thought that PLATO had no effect on the amount of contact they had with students, 39% thought they had more contact with students because of PLATO. Only 15% of the instructors thought that their contact with students was decreased because of PLATO.

Of those instructors who participated in the various extension courses provided by CERL staff members, 97% considered the courses moderately or very helpful. Of those who had interacted with the CERL liaison staff, 96% considered their contacts with the development staff members moderately or very helpful. At least 98% of the instructors considered their contacts with the local site coordinators to be moderately or very helpful. A large majority (80%) considered the local coordinators very helpful. On the basis of these results, the manner in which the PLATO system was implemented and demonstrated was viewed very favorably by the participating instructors.

Although instructor comments were generally favorable, they were not simply undiscriminating. A large minority (34%) thought that determining the correct answer for PLATO was a difficult or very difficult task for students. A sizable minority (19%-24%) judged the following aspects of PLATO to be difficult or very difficult for students: getting out of a lesson, getting into a new lesson, interpreting the PLATO vocabulary, and using help-type keys. On the other hand, few instructors (2%-7%) considered signing-on, signing-off, using the index, or locating the correct lesson to enter as difficult for students.

The large majority (80%-83%) of the instructors judged PLATO to have a positive impact on student attitudes and achievement, and a sizable majority (63%-64%) judged PLATO to have a positive impact on student-student and student-instructor interactions. On the other hand, the great majority (77%) of the instructors would definitely not want to teach their entire course using PLATO.

Although these generally positive comments of instructors are favorable to the PLATO system as it was implemented and demonstrated in this project, there was some additional evidence in the evaluation that tended to temper this interpretation somewhat.

The instructors who taught both PLATO and non-PLATO classes tended to judge their PLATO classes less favorably than their non-PLATO classes on ability, motivation, and achievement. Given the generally favorable assessment of the impact of PLATO on student attitudes and achievement by instructors, it seemed reasonable that these general impressions would be reflected in the specific comparisons of real PLATO and non-PLATO classes. Assuming that the classes were similar in ability and achievement (which the evaluation tends to confirm), the instructor judgments in these specific cases appear to be somewhat harsh on the PLATO students. Because instructors had no control over the pretests and posttests on which the study of achievement was based, there was no possibility of any self-fulfilling prophecies affecting the data analyses and results. Our speculation is that instructor expectations, based on generally favorable attitudes, simply were not fulfilled, and instructors tended to view the PLATO students less favorably than the real situation warranted. We cannot prove this, of course. The specific questions that were asked may have been confusing. Instructors may have interpreted them in ways not intended. They may have used criteria for their judgments which are not clearly apparent. Of those who stated a preference in teaching their classes, a greater percentage preferred teaching their PLATO classes than their non-PLATO classes.

Information regarding the impact of PLATO on instructors who were not using the system was collected from those instructors whose classes participated as comparison classes in the evaluation. In general, there was a considerable impact on these instructors. The vast majority (71%-79%) had observed PLATO in operation and had discussed the PLATO system with their colleagues and students. Approximately half of the instructors were interested in using PLATO as part of their instructional activities. At least half agreed that some of their students seemed favorably impressed with PLATO, that they would feel comfortable using PLATO as part of their course instruction, and that PLATO was a valuable resource in their institution. More than half thought that PLATO was not dehumanizing and that it did not suppress student creativity. A sizable minority of the non-PLATO instructors (29%-36%) were not willing to rate the impact of PLATO on student achievement, attitudes, and completion rates; on student-instructor and student-student interactions; and on faculty duties and responsibilities. Of those who were willing to hazard an opinion, they were more generally positive than negative in their impressions.

To summarize the impact of the PLATO implementation and demonstration on instructors, instructors were generally enthusiastic about and committed to the PLATO system. In judging the impact of the PLATO system on students, the data provided by instructors are not conclusive. In general, they judged the impact of PLATO on student attitudes and achievement to be positive. In the specific classes in this study, their judgments reflect a less conclusive judgment.

10.5 Impact of the PLATO system on the community colleges

In addition to the impact of the PLATO computer-based education system on students and instructors, there were other identifiable effects of the implementation and demonstration on the community colleges in a broader sense. The colleges provided significant funding to cover some of the communication, maintenance, and insurance costs of the system. They provided staff members for the PLATO sites to handle the scheduling of classes, to maintain the terminals, and to assist instructors in using the system. They provided released time for some teachers to work on lesson development and organize the efforts of the various subject matter instructor groups. They provided additional supervisory staff who organized the overall management of the PLATO effort and investigated additional areas of usage of the system in the colleges. They provided significant support for the project in the central administrative offices. This support was especially helpful to the evaluation effort. They provided access to student records at the central offices.

The central supervisory personnel have published studies and reports about the implementation and demonstration and have solicited additional funding for continuing and expanding the use of the PLATO system. Several instructors and site personnel performed personal research studies based on the PLATO implementation and demonstration.

PLATO had a clear impact on the communication between the community colleges and the University of Illinois through the Computer-based Education Research Laboratory as well as between the community colleges themselves. In the last semester of the demonstration year, the community colleges began working independently of CERL in assigning space on the system for courses and classes across the colleges. This required considerable communication between the colleges. In addition, the communication between instructors in the different colleges in developing lessons can be considered an impact on the colleges themselves.

Perhaps the most significant impact of the system on the colleges was their continued usage of the system beyond the initial externally funded demonstration period.

10.6 Implications of the evaluation

In this final section of the report, we present some implications of this evaluation based on our "personal insights," which have resulted from a close association with the funding agency (the National Science Foundation), the PLATO development and implementation staff (Computer-based Education Research Laboratory), and the participants in the community colleges over a period of several years. Whether or not these personal insights and implications are useful for determining policy in the future will depend upon their relevance to issues under consideration and the alternatives available to decision makers.

Our responses to three important questions may provide information for the decision maker, the potential user, and the educational research community: (1) Why did the PLATO implementation gain such high user acceptance and commitment in the absence of clearcut performance advantages? (2) What is the necessity and/or usefulness of an evaluation performed by an independent evaluator? and, (3) What are the implications for further research in the area of computer-based education?

Why did the PLATO implementation gain such high user acceptance and commitment in the absence of clearcut performance advantages? There is undoubtedly no single reason why high user acceptance occurred in this project. The instructional delivery system was technically reliable and was so perceived by instructors. The CERL liaison staff provided considerable assistance and support to instructors. The various components of the system were viewed favorably by instructors and students. The participating colleges invested their own funds in the project. The central administrative staff encouraged and supported participation. If any of these factors had been missing in the implementation, user acceptance may have been affected negatively.

Yet, based on our personal insights, we think these factors were necessary but not sufficient to account for high user acceptance. We believe that the additional factor that caused high user acceptance was the control that the instructors had, and perceived that they had, over the system. At the most fundamental level, the system was not a threat to their current instructional procedures. They were not required to use PLATO for any specified time nor to use any specified material. If they used PLATO at all, it was because they decided to use PLATO. If they used specific materials, it was because they chose the materials. They set up the lesson indices for their students. Instructors could use the course records on PLATO to verify student usage if they desired. But, they were not required to do so. If they decided on a specific day not to use PLATO when the class was scheduled to use it, they were not required to use it.

Admittedly, there was some pressure at the local sites to optimize the use of this costly medium, but the evaluators observed no feelings of pressure to use the system on the part of instructors. Although some instructors received released time to develop lessons and plans for integrating PLATO lessons into their established curricula, and some instructors may have been motivated to take the PLATO extension courses in order to fulfill academic credit requirements, we observed no anxiety on the part of instructors to use the PLATO system extensively or in specified ways. Our request of instructors not to use PLATO in some sections in order to implement the evaluation design was well received. The reason for this was probably the one phenomenon at work. The instructors were not threatened by the evaluators or the evaluation. This lack of anxiety was obvious also in the PLATO site personnel. There was some concern that our request that PLATO instructors teach some classes not using PLATO would decrease PLATO usage, but site personnel and the CERL development staff readily found other instructors to take up the slack.

Therefore, just as learner control of instruction is a goal of some instructional programs, we think instructor control, present to a great degree in this implementation and demonstration, is the primary reason for the high user acceptance of the PLATO system.

What is the necessity and/or usefulness of an evaluation performed by an independent evaluator? This question is of continued interest to a wide variety of audiences, including the developers, funders, and evaluators; the educational community interested in the potential of computer-based education; and to the research community.

It was not self-evident at the beginning of the project that the constraints and limitations of the real-world situation would be sufficiently flexible to support the implementation and demonstration of the PLATO project and the corresponding evaluation. A major hurdle was gaining the support and cooperation of instructors with other demands on their time and interest already in place. This project has shown that if sufficient resources are allocated, such projects can be implemented in real-world settings.

Evaluators are often just about as popular as tax collectors, but their presence tends to encourage the developers to maintain their thrust in directions that produce measurable outcomes. There is need for continuing flexibility in approach as modifications become necessary to deal with real-world constraints. Independent evaluators do not necessarily provide all the information desired for formative purposes nor all of the totally conclusive and unambiguous information desired for summative purposes. They do provide a useful buffer between the developers and the decision makers. They work closely with the developers and, because of this, are able to understand more fully the complexities of the project and the realistic compromises made in molding initial goals to meet the requirements imposed by real-world constraints. The independent evaluators are useful to the decision makers in that they can design an evaluation to provide the kind of information that they perceive as useful to the decision makers. The independent evaluators thus provide an important communication link between implementation staff and decision makers, safeguarding the former from delivering too little in terms of interpretable information and restraining the latter from requiring too much in terms of totally conclusive results.

Independent evaluations can be regarded as assuming this two-fold responsibility. On the one hand, the evaluation should not react with the project so fundamentally that the final project is significantly different from that which the developers originally envisioned. On the other hand, the evaluation should provide sufficient constraints so that the project will yield information useful to the decision makers. The implication of this evaluation is that such a two-fold responsibility can be fulfilled with considerable success even in large-scale real-world implementations and demonstrations.

Within the resources available for an evaluation effort, and in response to the original goals of the project, the limitations imposed by real-world constraints, the general expectations expressed by the funding agency, the input of various consultants during the course of the project, a very substantial amount of information can be collected, summarized, and interpreted. Focusing the effort more in the direction of internal and formative evaluation or requiring developers and participants to accomplish small but well-controlled artificial experiments may result in the collection of less interpretable information for decision makers. Consultation should be continuous and intensive in order to maintain a continuing understanding of changes and modifications made during the course of the project and to avoid misconceptions and false expectations.

What are the implications for future research in the area of computer-based education? Although students were generally favorable in their impressions of the PLATO computer-based education system, there was a minority of students who did not like using PLATO, who considered using PLATO dehumanizing and boring. A useful area for further research would be in the direction of providing PLATO instruction on a voluntary basis at the student level. Although the majority of students and instructors in this study stated that they did not want the entire course taught on PLATO, there are undoubtedly a range of strategies for using PLATO that can be planned, implemented, and evaluated within the context of an integrated use of the system in the ongoing instructional setting. As more lessons are developed for the PLATO system, planned variation in the use of PLATO should be a fruitful area for further research.

In addition to manipulating the medium to provide more or less computer-based instruction or differing strategies for the delivery of instruction, further research on the instructional materials themselves would be useful. During the current implementation and development project, instructional materials were produced under serious time constraints and were continually modified. As lessons, and groups of lessons, become more stable, further research can be carried out to evaluate in focused studies the educational effectiveness of carefully designed lessons which cover a certain topic or unit of instruction. The general thrust in the initial PLATO implementation and demonstration project was to encourage instructors to design and develop their own lessons. A beginning was made in developing peer reviews of lessons and strategies for field testing lessons on smaller groups of students. This beginning should be expanded into a more detailed and thorough process for evaluating specific lessons within the PLATO system. The evaluation of specific lessons or groups of lessons would require that instructors sacrifice some of the freedom that was so evident in the initial implementation and demonstration. The experience gained in the evaluation leads us to believe that instructors would cooperate and be interested in such research studies.

10.7 Conclusion

Based on the data collected in the community college project, the PLATO computer-based education system was implemented and demonstrated essentially as had been projected in the initial plans of the developers at the Computer-based Education Research Laboratory. The system provided a medium for instruction with substantial appeal to both students and instructors. The PLATO system had no consistent positive nor negative effects on student achievement nor attrition. The cooperative effort between instructors and developers was successful in that a substantial number of PLATO lessons were designed, developed, and integrated into ongoing community college courses in the five targeted subject areas. The usage of PLATO by students and instructors exceeded the initial expectations of the developers although the extent of usage in classes was somewhat less on the average than had been projected originally. Based on the personal insights of the evaluators, the critical factor which accounted for the high acceptance and usage of PLATO was the control that instructors had, and perceived that they had, over the use of the system.

This initial evaluation of the implementation and demonstration of the PLATO IV computer-based education system in the community college provides a comprehensive base of information about the impact of the PLATO system on students, instructors, and colleges.

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Table 2.2.2a

Accountancy Usage by Class
Fall 1974

College	Course	Total # of Students	Average # of Hours Per Student Per Semester
II	Bus 101	30	8.02
	Bus 101	40	5.66
	Bus 101	12	2.05
III	Bus 101	61	2.93
	Bus 101	66	1.95
	Bus 101	59	7.82
	Bus 101	70	5.86
	Bus 101	69	5.07
	Bus 102	23	2.55
	Bus 102	63	3.97
	Bus 100	28	3.97
	Bus 141	64	3.32
	Bus 203	28	0.56
IV	Bus 101	22	5.99
	Bus 102	41	7.88

Table 2.2.2a (cont.)

Accountancy Usage by Class
Spring 1975

College	Course	Total # of Students	Average # of Hours Per Student Per Semester
I	Bus 101	35	4.10
II	Bus 101	24	2.90
III	Bus 101	36	4.30
	Bus 101	62	3.80
	Bus 101	5	3.70
	Bus 101	69	7.50
	Bus 102	24	0.86
	Bus 102	54	0.80
	Bus 102	32	6.40
	Bus 100	25	3.70
V	Acct/Clerk	17	7.77
	Acct/Clerk	16	4.11

Table 2.2.2a (cont.)

Accountancy Usage by Class
Fall 1975

College	Course	Total # of Students	Average # of Hours Per Student Per Semester
I	Bus 101	35	8.50
II	Bus 101	32	11.90
III	Bus 101	36	3.80
	Bus 101	34	2.80
	Bus 101	37	3.60
	Bus 101	36	8.70
	Bus 101	31	2.90
	Bus 102	3	3.70
	Bus 102	16	1.90
	Bus 102	40	1.90
	Bus 102	29	1.10
	Bus 102	24	1.20
	Adult Ed/Acct	29	7.90
IV	Acct 101	56	4.90
	Acct 102	43	6.50
	Learning Lab	11	5.50
	Learning Lab	19	5.50
	Learning Lab	31	5.20
	Learning Lab	21	9.10
V	Acct/Clerk	10	4.90

Table 2.2.2b

Chemistry Usage by Class
Fall 1974

College	Course	Total Number of Students	Average Number of Hours Per Student Per Semester
I	Chem 121	39	5.95
	Chem 121	26	1.09
	Chem 121	33	4.56
	Chem 201	19	1.37
	Chem 201	25	2.84
II	Chem 121	29	2.75
	Chem 121*	83	2.72
	Chem 201*	89	6.67
III	Chem 121*	77	4.96
	Chem 201*	117	5.72
	Chem 203	17	1.01
	Chem 205*	53	5.04
IV	Chem 101*	67	10.86

*Combined data for more than one section

Table 2.2.2b (cont.)

Chemistry Usage by Class
Spring 1975

College	Course	Total Number of Students	Average Number of Hours Per Student Per Semester
I	Chem 121	33	6.4
	Chem 121	**	**
	Chem 121	**	**
	Chem 201/202	29	4.0
	Chem 201/202	33	5.7
	Chem 201	36	5.2
	Chem 203	20	3.2
II	Chem 121	40	5.1
	Chem 201*	102	3.8
III	Chem 121	34	3.0
	Chem 121	38	5.5
	Chem 121	54	6.4
	Chem 201	28	1.5
	Chem 201/202	30	4.5
	Chem 201/202	11	3.6
	Chem 203	26	3.3
	Chem 207	26	3.3
IV	Chem 102	48	6.2

*Combined data for more than one section

**Data not available

Table 2.2.2b (cont.)

Chemistry Usage by Class
Fall 1975

College	Course	Total Number of Students	Average Number of Hours Per Student Per Semester
I	Chem 121	36	4.0
	Chem 121	31	4.0
	Chem 121	33	9.4
	Chem 121	27	3.0
	Chem 201	22	8.5
II	Chem 121	28	3.1
	Chem 121	36	6.6
	Chem 121	29	11.8
	Chem 121	39	8.2
	Chem 121	25	3.4
	Chem 201	39	4.3
	Chem 201	37	9.5
	Chem 201	11	10.1
III	Chem 121	26	6.0
	Chem 121	37	8.8
	Chem 121	36	6.9
	Chem 201	27	3.3
	Chem 201	44	11.2
	Chem 205	28	6.1
IV	Chem 101	22	12.3
	Chem 101	23	11.9
	Chem 101	18	13.4

Table 2.2.2c

English Usage by Class
Fall 1974

College	Course	Total Number of Students	Average Number of Hours Per Student Per Semester
I	Eng 100	21	3.90
	Eng 101	33	5.23
	Eng 101	36	3.49
	Eng 101	26	1.04
	Eng 101	26	4.24
	Eng 101	18	1.30
II	Eng 100	21	1.94
	Eng 100	27	1.89
	Eng 100	30	2.03
	Eng 100	18	1.74
	Eng 100	32	2.24
	Eng 100	39	2.06
	Eng 100	32	2.43
	Eng 100	38	1.43
	Eng 101	32	3.27
	Eng 101	29	2.68
III	Eng 100	36	3.73
	Eng 100	32	3.72
	Eng 100	34	3.76
	Eng 101	32	1.52
	Eng 101	35	0.84
	Eng 101	34	1.83
	Eng 101	31	6.15
	Eng 101	28	2.51
	Eng 101	23	2.77
IV	Eng 095	35	6.29
	Eng 101	26	1.20
	Eng 101	26	0.92
	Eng 101	25	0.60
	Eng 101	27	1.51
	Eng 104	27	0.80
	Eng 104	26	1.57
	Eng 104	21	8.00
	Eng 110	22	0.64
V	Eng.Skills/Clerk	25	6.25
	Eng.Skills/Clerk	11	3.26
	Bus. Education	16	3.37
	Basic Education	16	3.08
	Basic Education	22	3.86
	Related Education	20	2.01

Table 2.2.2c (cont.)

English Usage by Class
Spring 1975

College	Course	Total Number of Students	Average Number of Hours Per Student Per Semester
I	Eng 100	32	5.13
	Eng 100	25	6.01
	Eng 100	18	1.04
	Eng 100	30	4.36
	Eng 101	37	1.27
	Eng 101	33	5.14
	Eng 101	28	5.94
	Eng 101	38	3.68
	Eng 101	40	2.06
	Eng 102	29	1.48
	Eng 102	35	1.24
	Eng 102	30	1.22
	GED	31	0.70
	Reading 125	28	4.82
II	Eng 101	20	0.70
	Eng 101	38	0.73
	Eng 101	38	1.51
	Eng 101	39	0.52
	Eng 101	39	3.01
	Eng 101	33	7.31
	Eng 101	33	3.99
	Eng 101	39	3.03
III	Eng 100	29	7.90
	Eng 100	21	8.34
	Eng 100	17	8.62
	Eng 100	18	7.79
	Eng 101	21	11.05
	Eng 101	37	0.89
	Eng 101	36	0.57
	Eng 101	19	1.12
	Eng 101	33	7.31
	Eng 102	28	0.87
	Eng 102	23	1.09
IV	Eng 092*	65	4.84
	Eng 104	35	6.66
	Eng 105	20	2.59
V	Eng.Skills/Clerk	27	4.02
	Eng.Skills/Clerk	35	5.41
	Eng.Skills/Clerk	34	4.69
	Bus. Education	39	3.94
	Stenography	37	6.27
	Stenography	39	6.19

*Combined data for more than one section

Table 2.2.2c (cont.)

English Usage by Class
Fall 1975

College	Course	Total Number of Students	Average Number of Hours Per Student Per Semester
I	Eng 100/101	21	4.10
		18	1.80
		22	5.10
		23	6.00
		26	4.60
		25	5.00
		28	9.80
		26	1.90
		25	4.30
		32	5.20
		27	5.20
	Eng 102	30	1.80
		34	1.60
		16	0.90
	Reading	24	6.80
		34	2.20
		28	3.10
		17	0.80
	GED	35	1.90
		26	3.70
		27	2.00
		24	1.30
II	Eng 100/101	22	1.90
		23	4.70
		26	1.50
		22	3.50
		9	2.10
		21	2.00
		31	2.60
		27	6.30
		21	1.60
		27	2.70
		25	3.20
		26	2.20
III	Eng 100/101	22	4.90
		23	5.60
		9	5.90
		27	6.60
		25	5.60
		25	4.70
	Eng. for foreign students	10	9.00

Table 2.2.2c English Usage by Class, Fall 1975 (cont.)

College	Course	Total Number of Students	Average Number of Hours Per Student Per Semester
IV	Eng 099*	42	2.90
	Eng 099	11	5.00
		16	3.40
		38	1.90
		9	6.10
	Eng 101*	66	6.20
	Eng 101	19	3.80
		8	2.10
		10	3.30
		24	3.00
		19	2.00
V	Bus. Skills	10	3.80
		5	2.40
		9	1.90
		12	1.80
		19	2.80
		17	4.70
		22	2.80
		21	2.80
		15	3.60
		15	3.60
		13	3.20

*Combined data for more than one section

Table 2.2.2d

Mathematics Usage by Class
Fall 1974

College	Course	Total Number of Students	Average Number of Hours Per Student Per Semester
I	Math 095	35	3.67
	Math 107	29	3.07
	Math 111	31	4.05
	Math 111	35	3.76
	Math 111	28	3.83
	Math 111	24	1.13
	Math 111	35	1.53
	Math 141	31	2.58
	Math/GED	34	1.55
	Math/GED	37	1.20
IV	Math 091	18	3.00
	Math 100	30	4.45
	Math 120	12	7.86
	Math 124	20	0.80
	Math 124	22	0.90
	Math 131	22	1.88
	Math 131	18	3.49
V	Math Skills	19	2.14
	Math Skills	19	2.50
	Math Skills	18	1.09
	Math Skills	15	1.49
	Math Skills	22	2.90
	Math Skills	20	3.23

Table 2.2.2d (cont.)

Mathematics Usage by Class
Spring 1975

College	Course	Total Number of Students	Average Number of Hours Per Student Per Semester
I	Math 111	32	6.21
	Math 111	31	5.85
	Math 111	24	5.00
	Math 111	26	2.63
	Math 111	24	0.77
	Math 111	8	1.69
	Math/GED	62	1.60
	Math/GED	52	1.96
III	Math 095	33	1.62
	Math 112	26	3.00
	Math 140	22	1.50
IV	Math 092	10	5.05
	Math 100	27	4.53
	Math 100	28	3.31
	Math 100	28	6.03
	Math 120	18	9.93
	Math 120	25	9.81
	Math 120	18	8.60
	Math 125	25	3.92
V	Math Skills	22	6.30
	Math Skills	15	9.40
	Math Skills	13	11.60
	Math Skills	36	11.20
	Math Skills	19	3.00
	Math Skills	21	2.00
	Math Skills	44	6.00
	Math Skills	24	3.20

Table 2.2.2d (cont.)

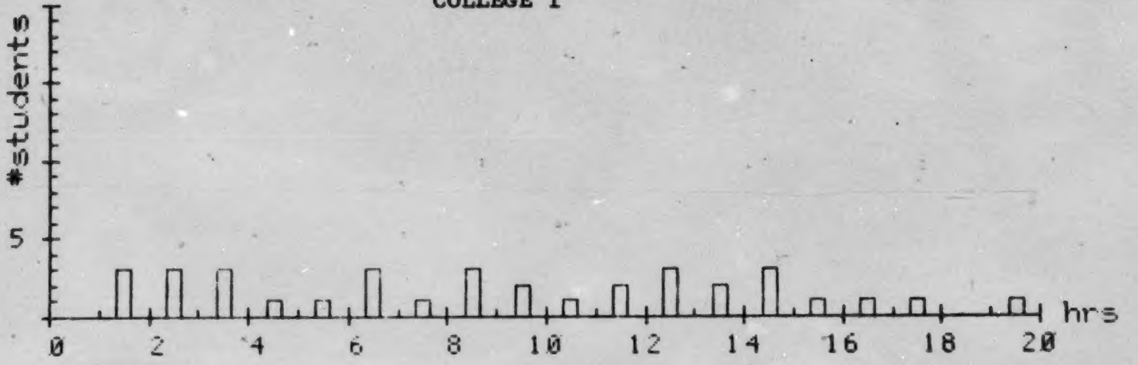
Mathematics Usage by Class
Fall 1975

College	Course	Total Number of Students	Average Number of Hours Per Student Per Semester
I	Math 111	29	6.10
	Math 111	32	6.50
	Math 111	17	2.10
	Math 111	21	3.40
	Math 111	39	1.70
	Math 111	32	2.30
	GED	59	2.50
	GED	47	2.80
	Adult Ed.	20	6.60
III	Adult Ed.	23	5.90
IV	Math 091	4	0.80
	Tech. Math	3	4.30
	Tech. Math	21	0.80
	Math 123	27	2.40
	Math 123	24	5.80
	Math 123	29	1.90
	Math 123	28	2.30
V	Math Skills/ Machinists	12	3.50
	Math Skills/ Machinists	26	2.60
	Math Skills/ Machinists	8	4.80
	General Math	20	5.40

Figure 2.2.1a

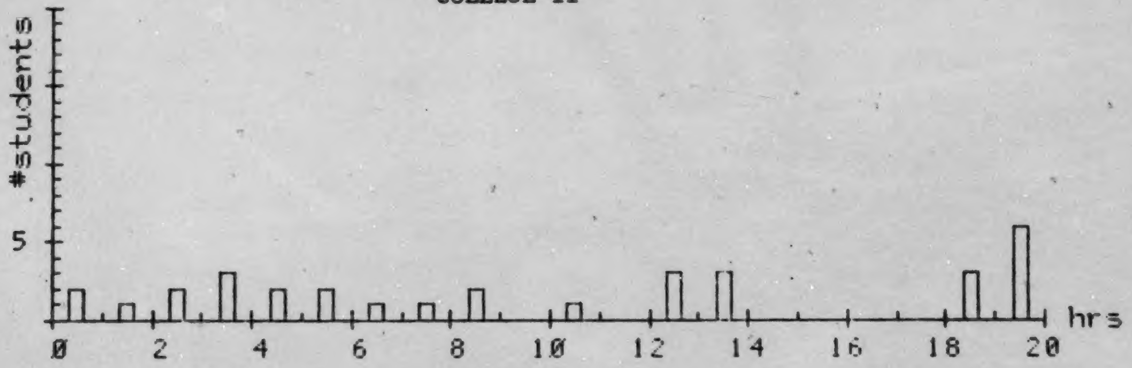
Histograms of Student Usage in Fall 1975 Business 101 Classes

COLLEGE I



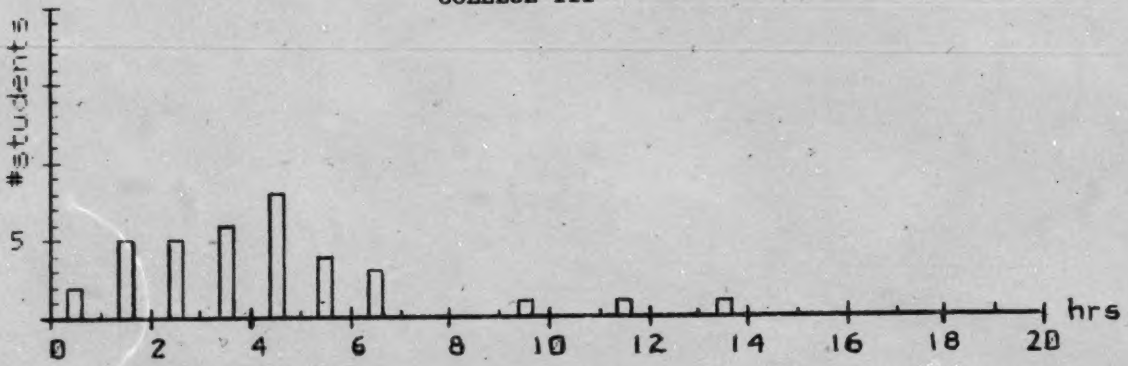
35 students, 298 hours. Average: 8.5

COLLEGE II



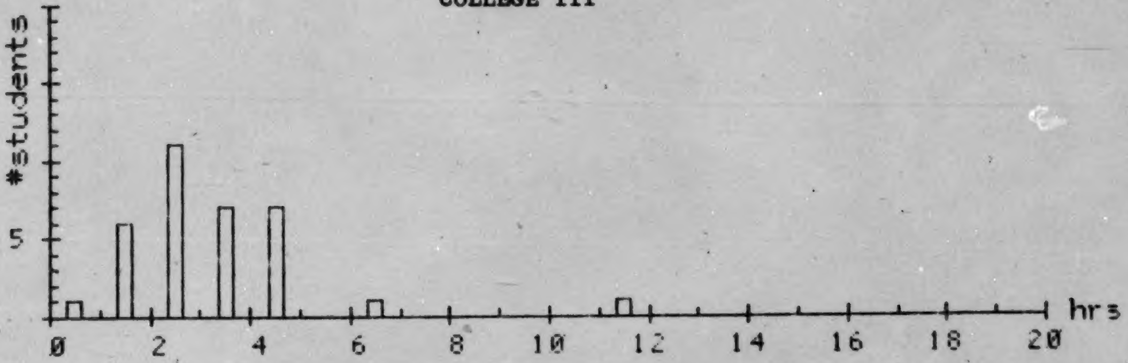
32 students, 383 hours. Average: 12.0

COLLEGE III



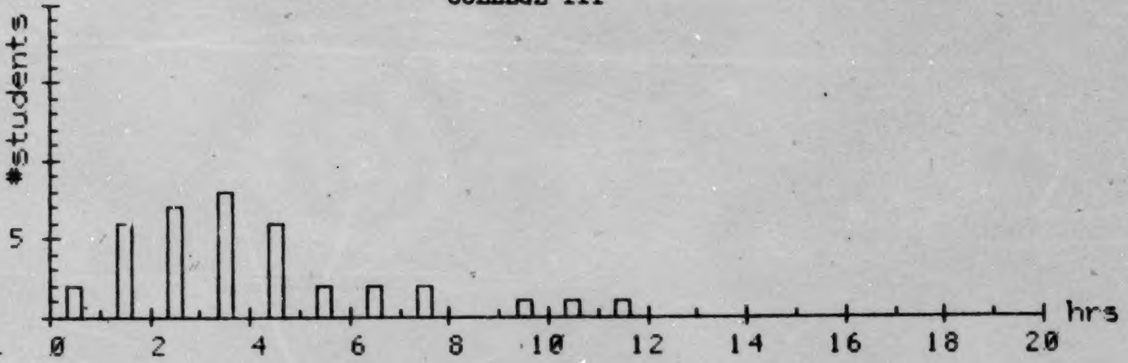
36 students, 136 hours. Average: 3.8

COLLEGE III



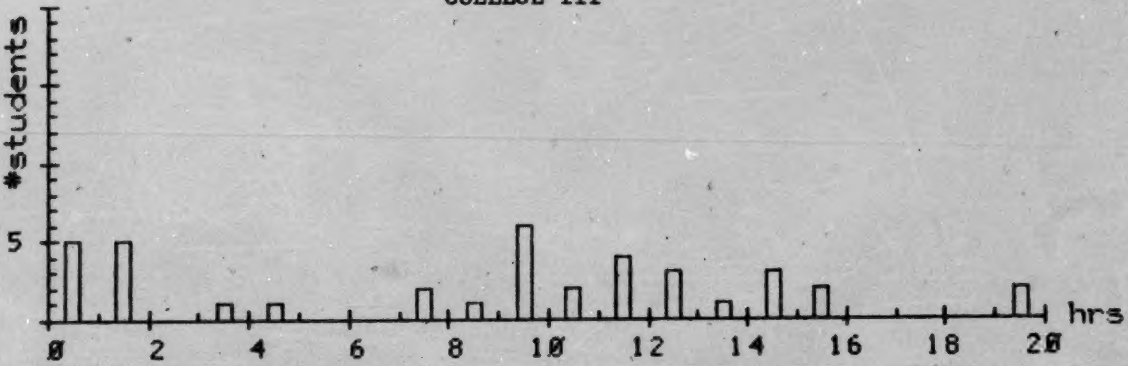
34 students, 94 hours. Average: 2.0

COLLEGE III



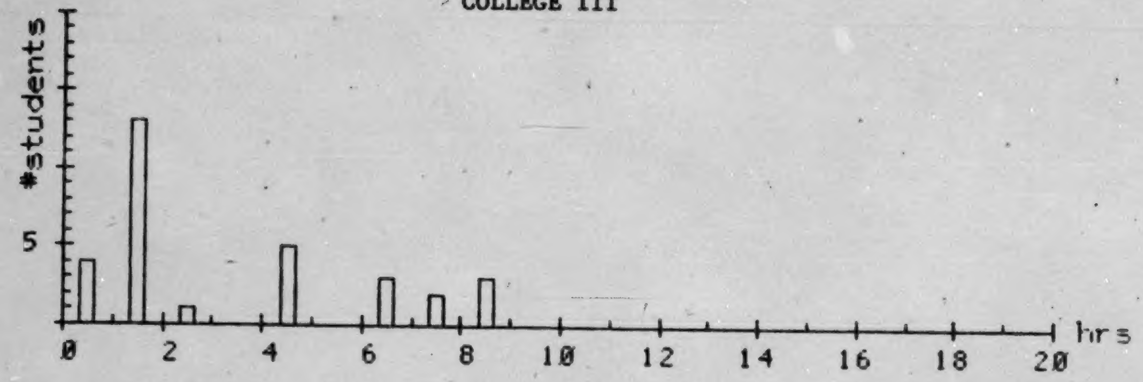
38 students, 134 hours. Average: 3.5

COLLEGE III



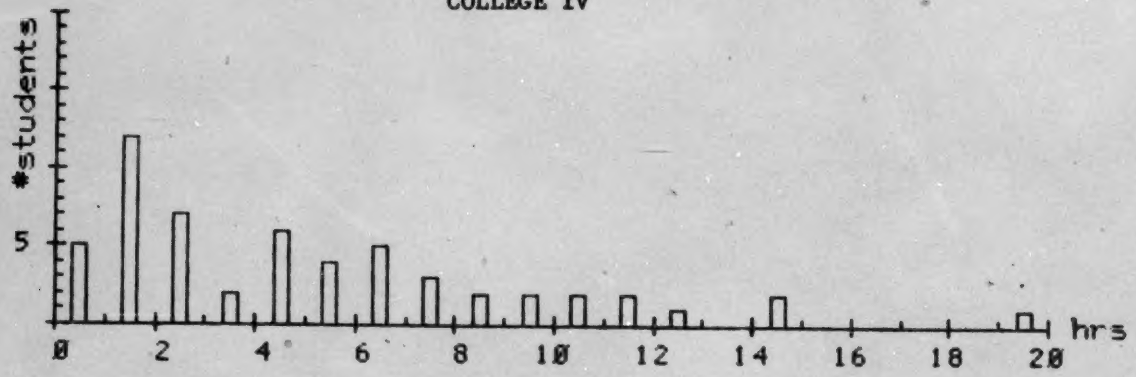
38 students, 316 hours. Average: 8.3

COLLEGE III



31 students, 91 hours. Average: 2.9

COLLEGE IV

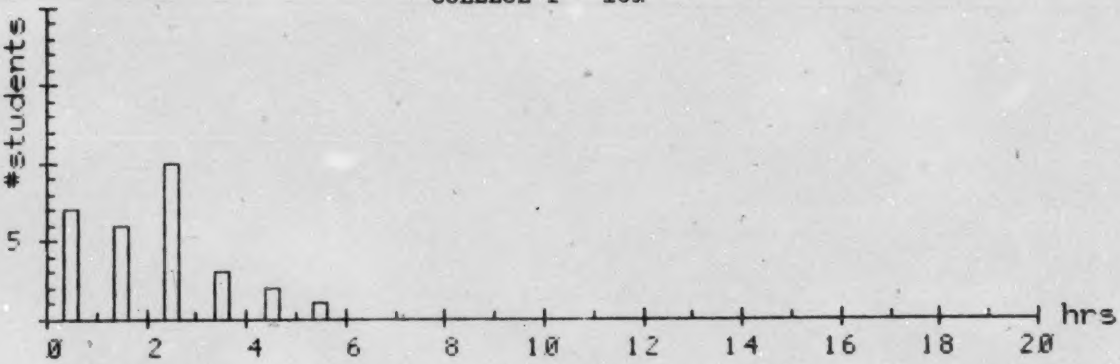


56 students, 277 hours. Average 4.9

Figure 2.2.1b

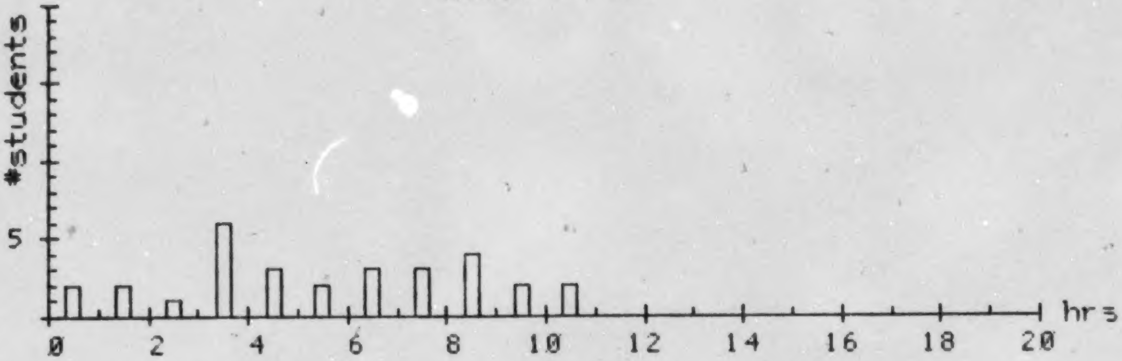
Histograms of Student Usage in Fall 1975 Biology 101/111 Classes

COLLEGE I - 101



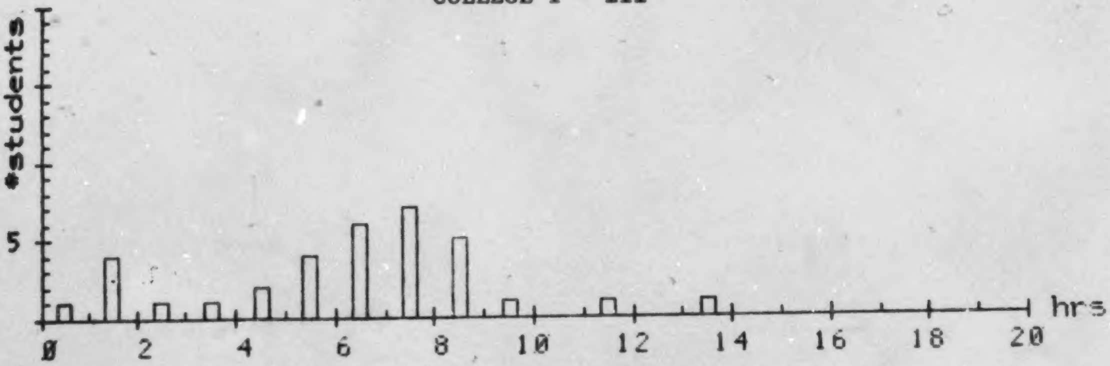
29 students, 48 hours. Average: 1.7

COLLEGE I - 111



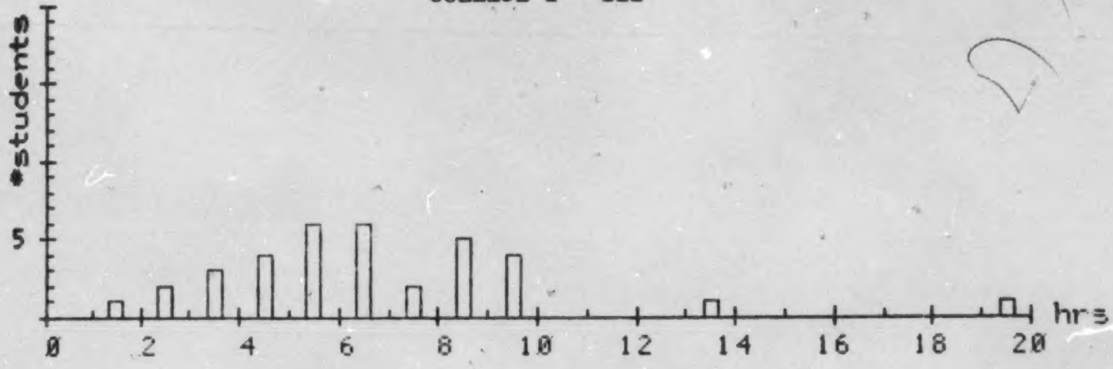
30 students, 153 hours. Average: 5.1

COLLEGE I - 111



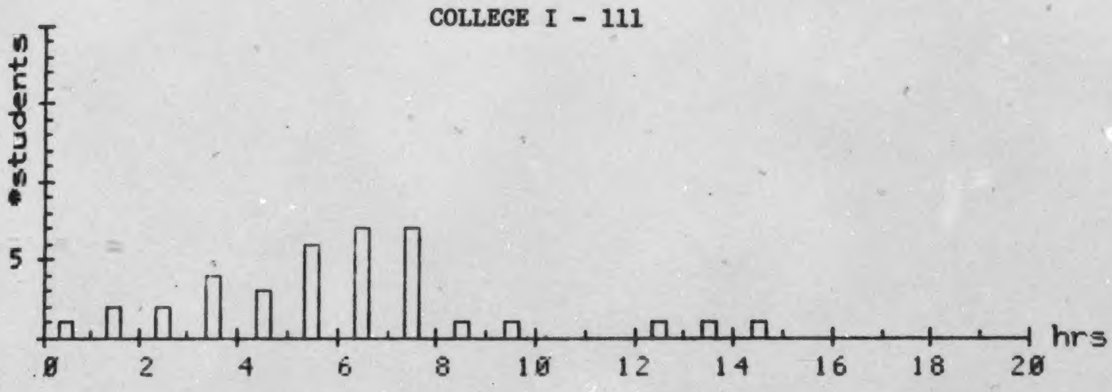
34 students, 195 hours. Average: 5.7

COLLEGE I - 111



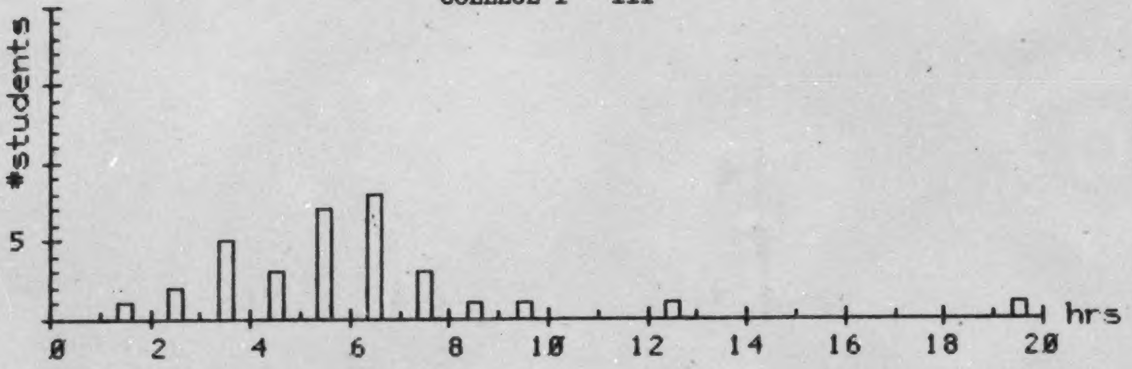
35 students, 223 hours. Average: 6.4

COLLEGE I - 111



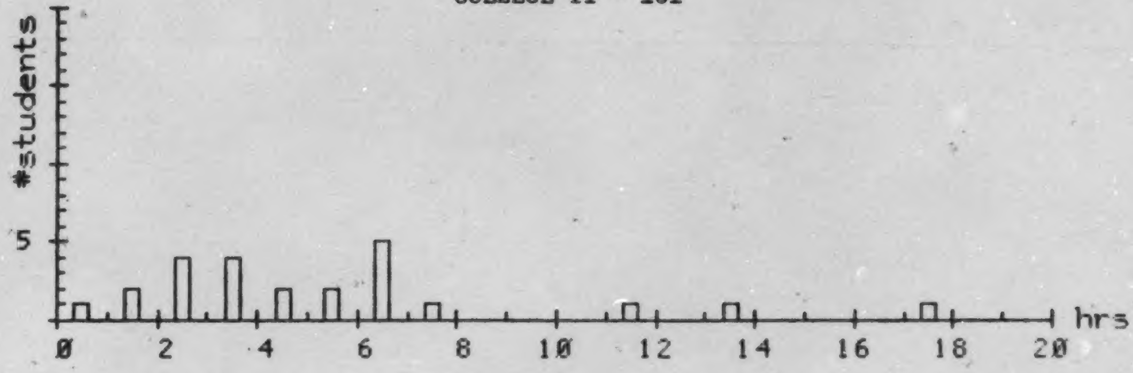
37 students, 207 hours. Average: 5.6

COLLEGE I - 111



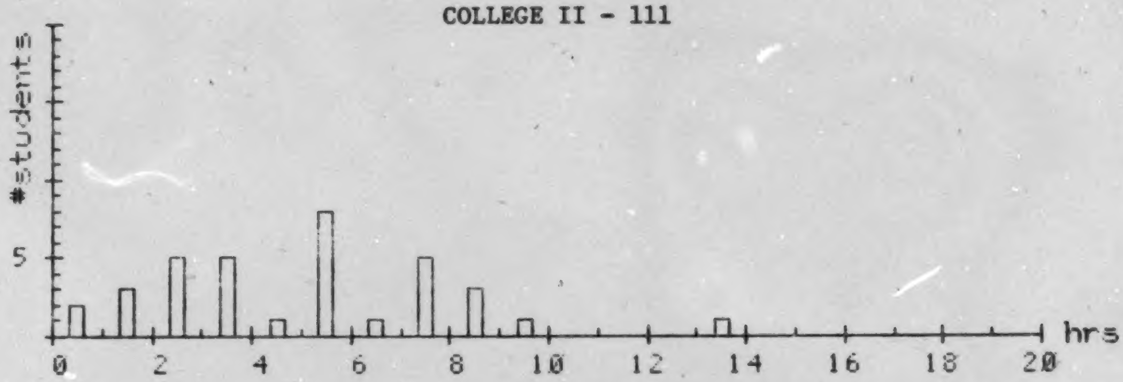
33 students, 186 hours. Average: 5.6

COLLEGE II - 101



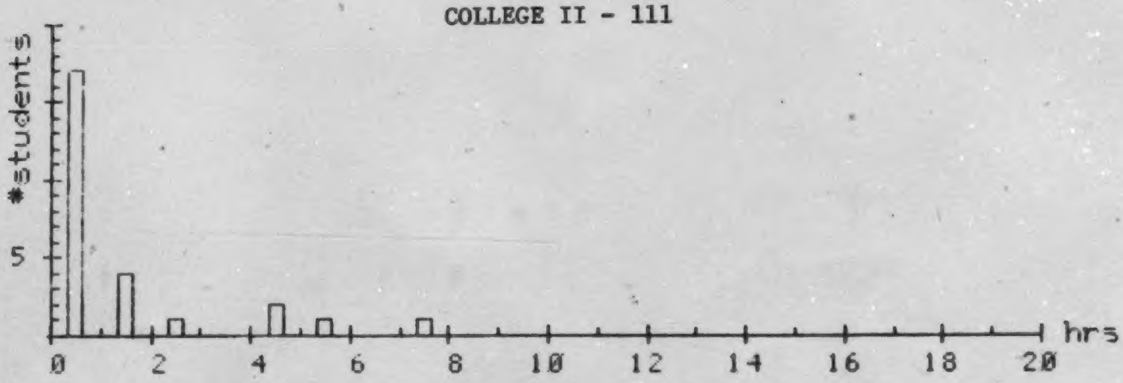
24 students, 118 hours. Average: 4.9

COLLEGE II - 111



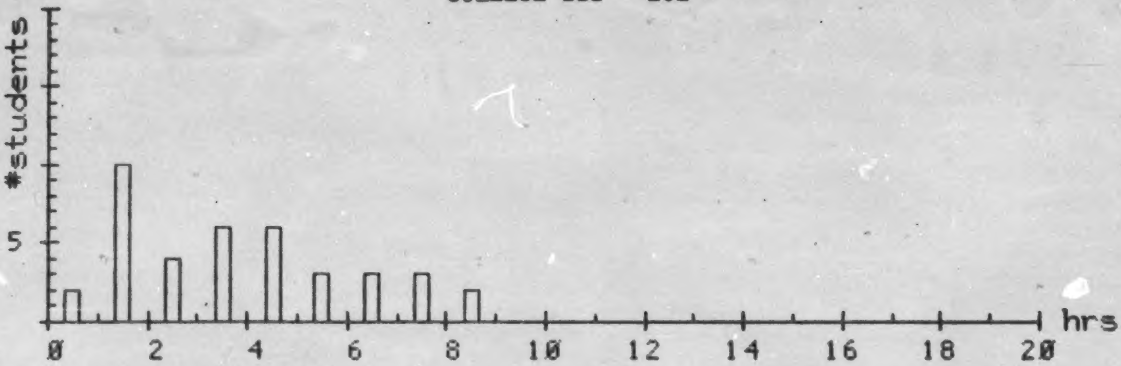
35 students, 159 hours. Average: 4.5

COLLEGE II - 111



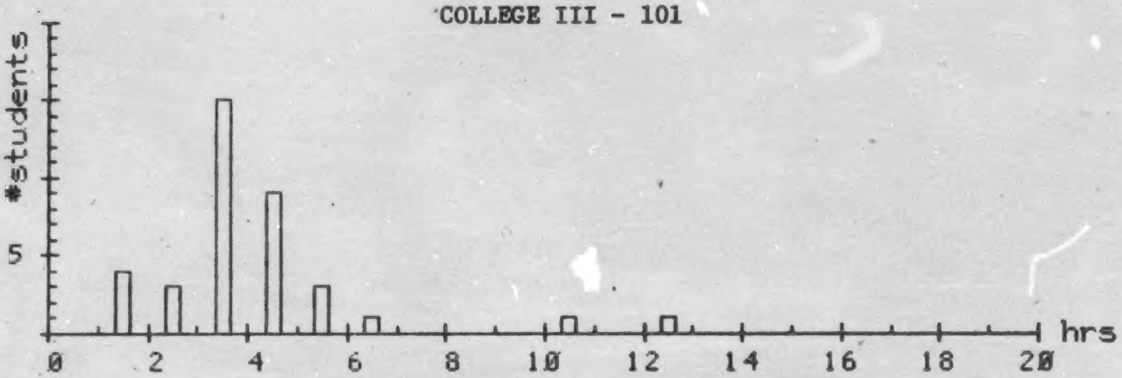
26 students, 26 hours. Average: 1.0

COLLEGE III - 101



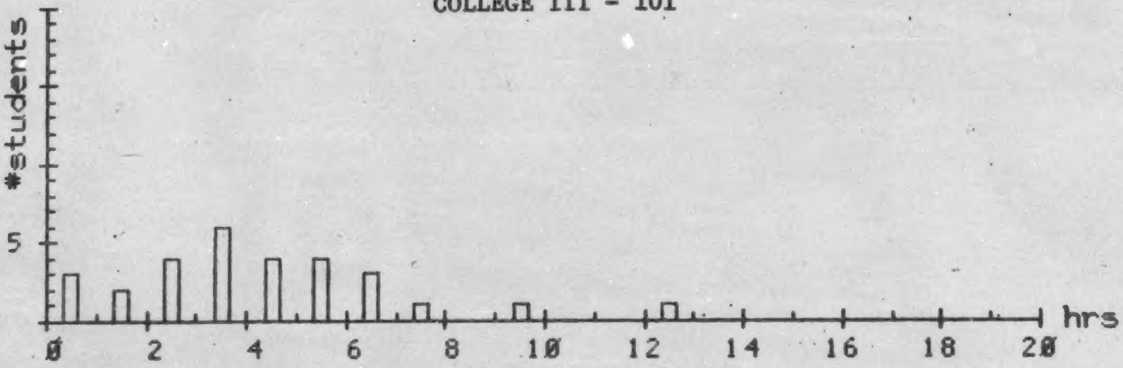
39 students, 130 hours. Average: 3.3

COLLEGE III - 101



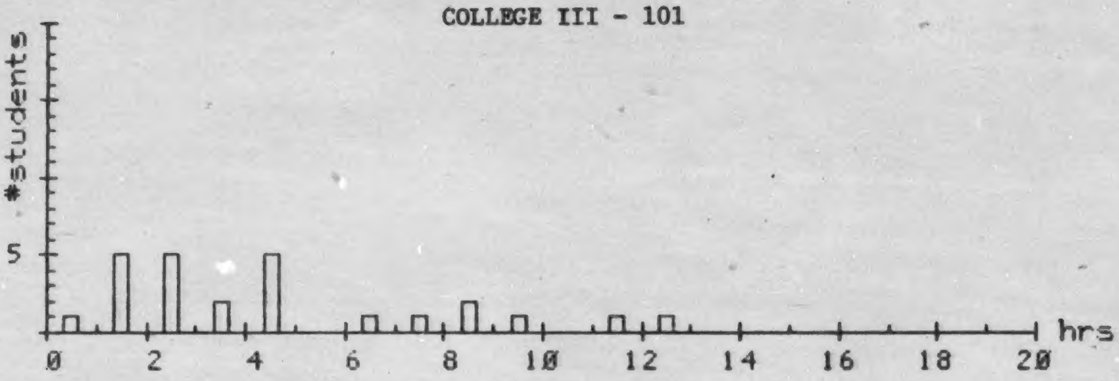
37 students, 134 hours. Average: 3.6

COLLEGE III - 101



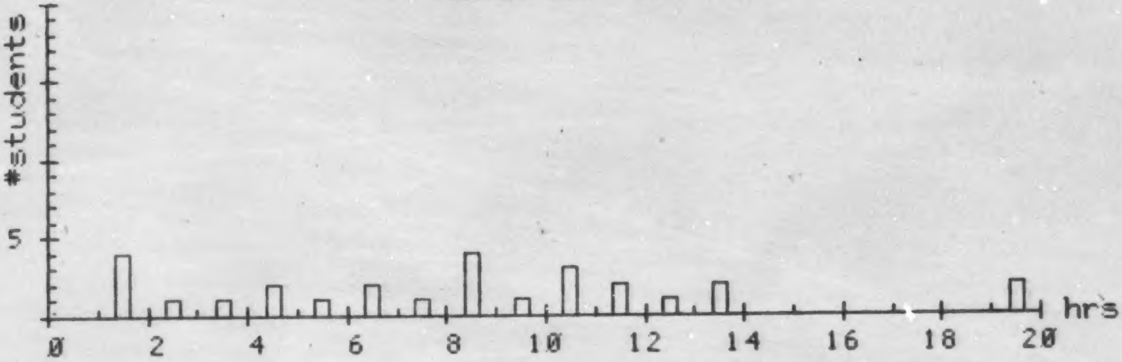
29 students, 110 hours. Average: 3.8

COLLEGE III - 101



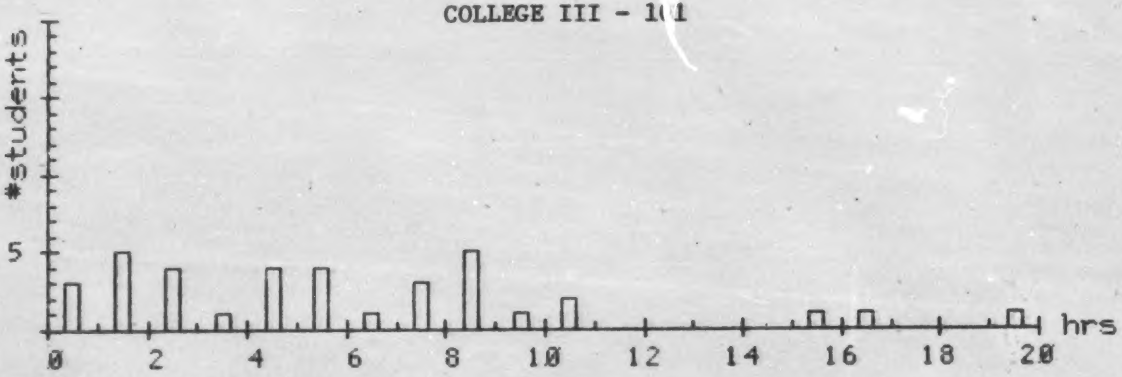
25 students, 102 hours. Average: 4.1

COLLEGE III - 101



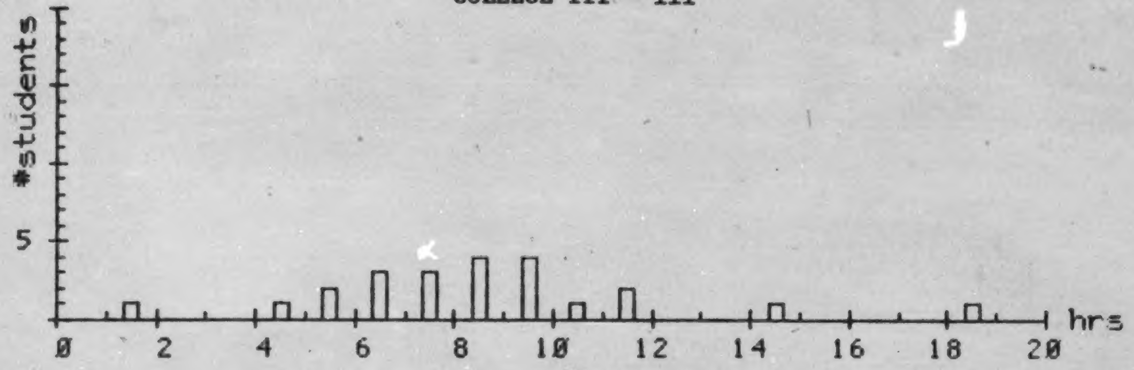
27 students, 230 hours. Average: 8.5

COLLEGE III - 101



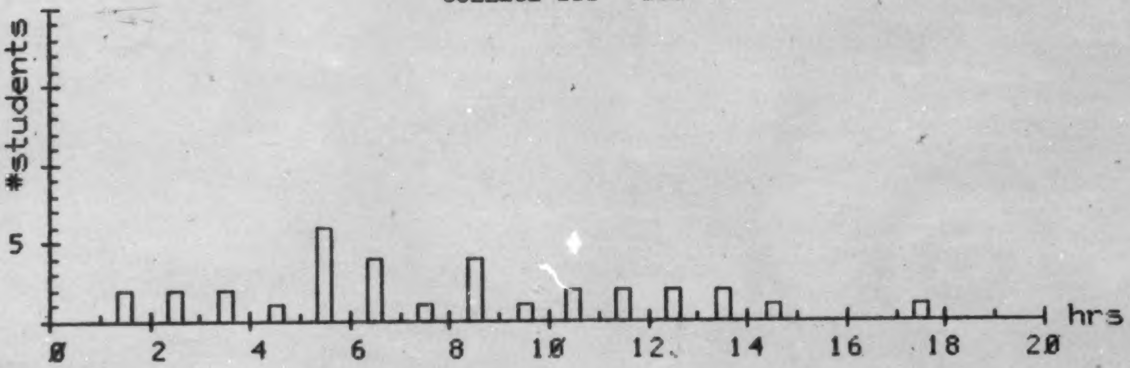
36 students, 198 hours. Average: 5.5

COLLEGE III - 111



23 students, 186 hours. Average: 8.1

COLLEGE III - 111

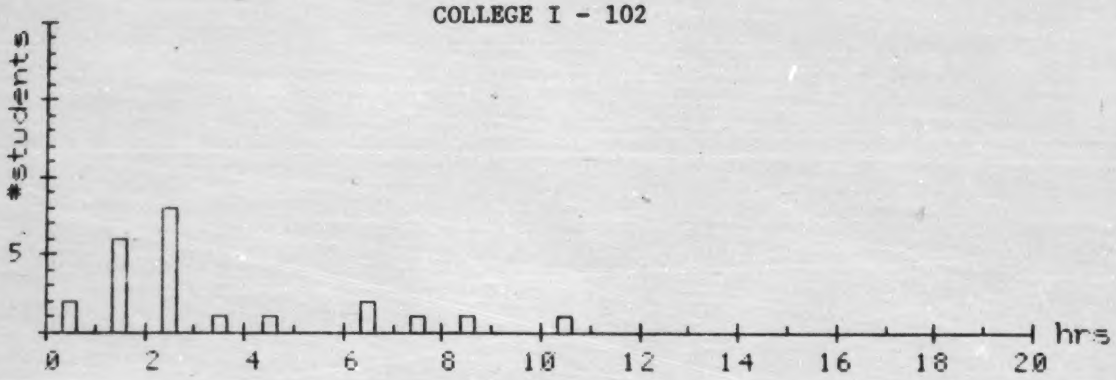


33 students, 241 hours. Average: 7.3

Figure 2.2.1c

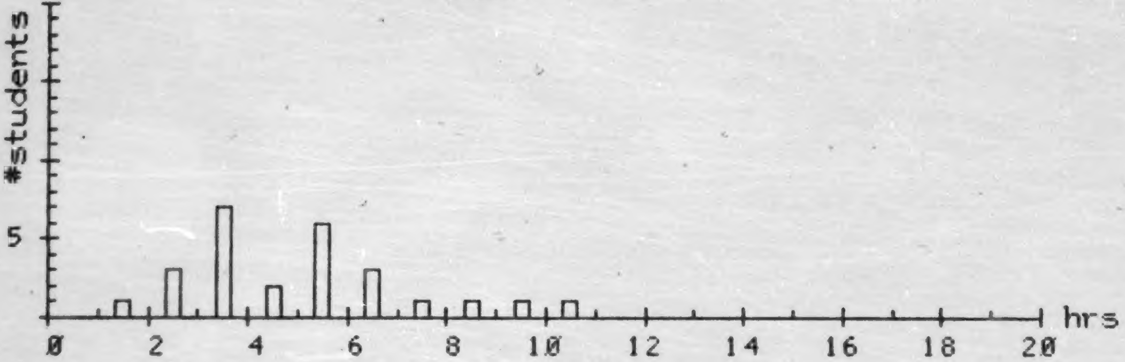
Histograms of Student Usage in Fall 1975 Biology 102/112 Classes

COLLEGE I - 102



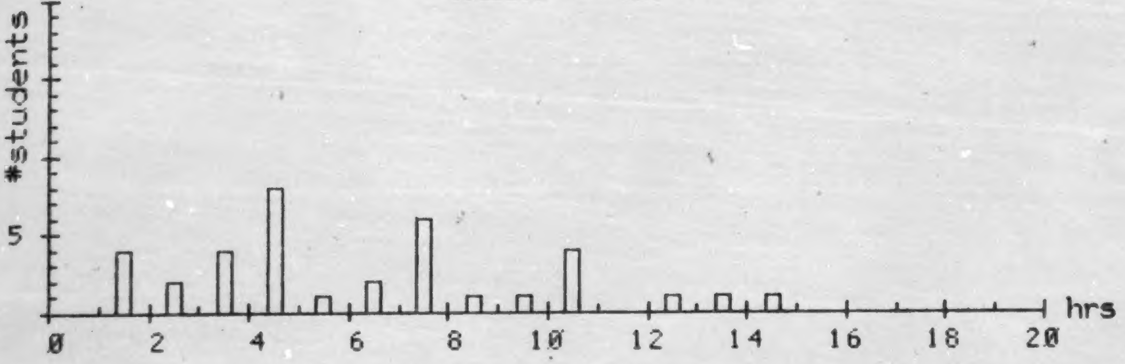
23 students, 66 hours. Average: 2.9

COLLEGE I - 112



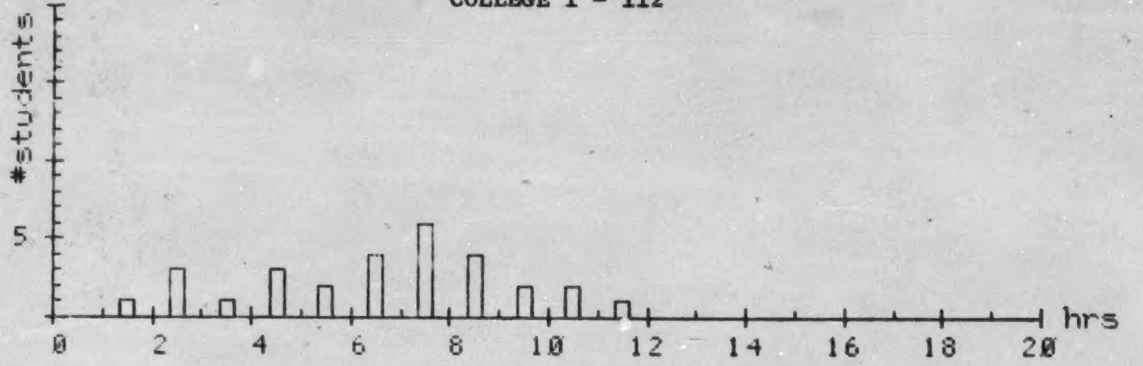
26 students, 118 hours. Average: 4.5

COLLEGE I - 112



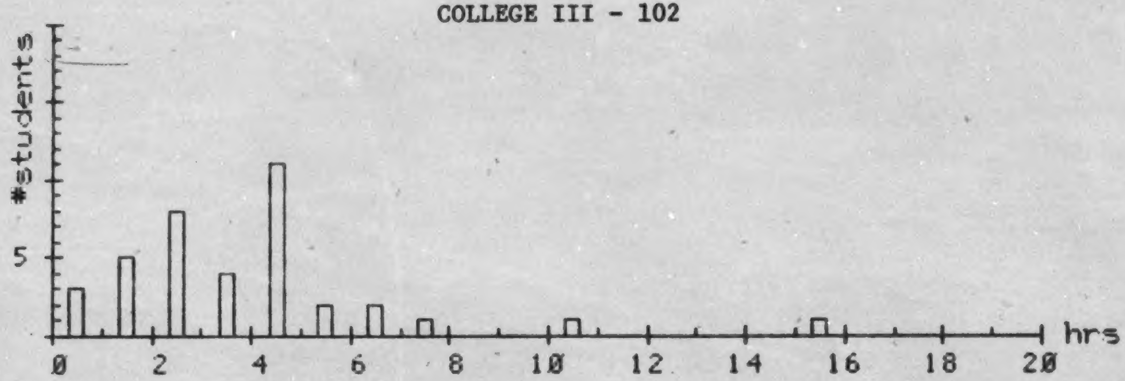
36 students, 207 hours. Average: 5.8

COLLEGE I - 112



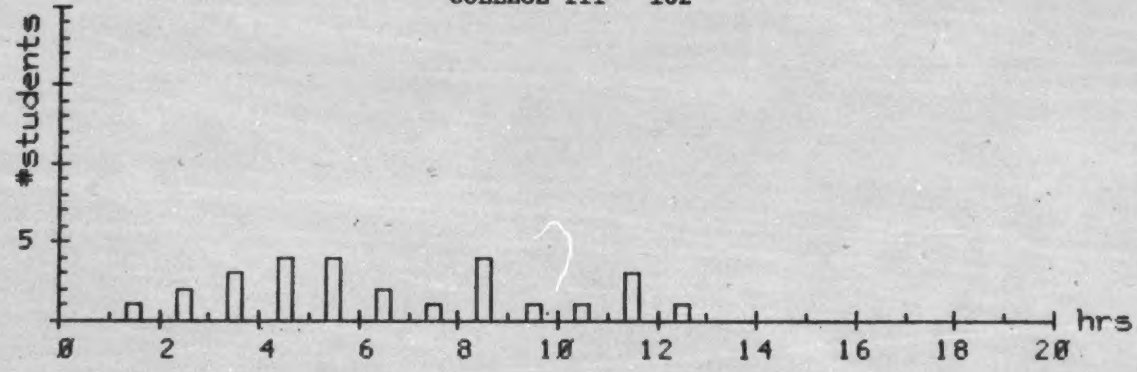
29 students, 179 hours. Average: 6.2

COLLEGE III - 102



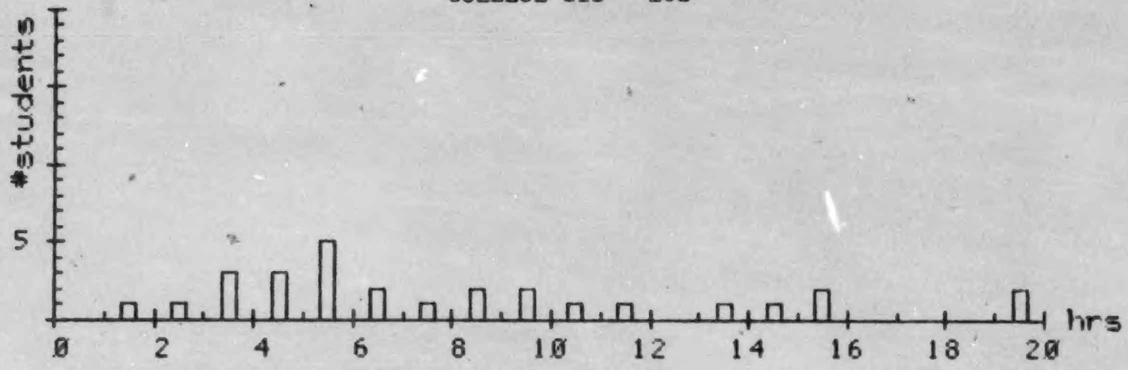
38 students, 131 hours. Average: 3.4

COLLEGE III - 102



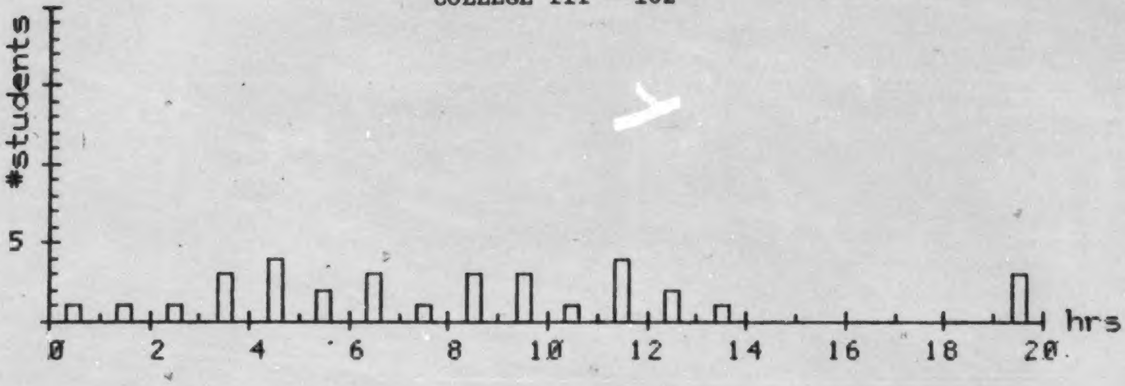
27 students, 165 hours. Average: 6.1

COLLEGE III - 102



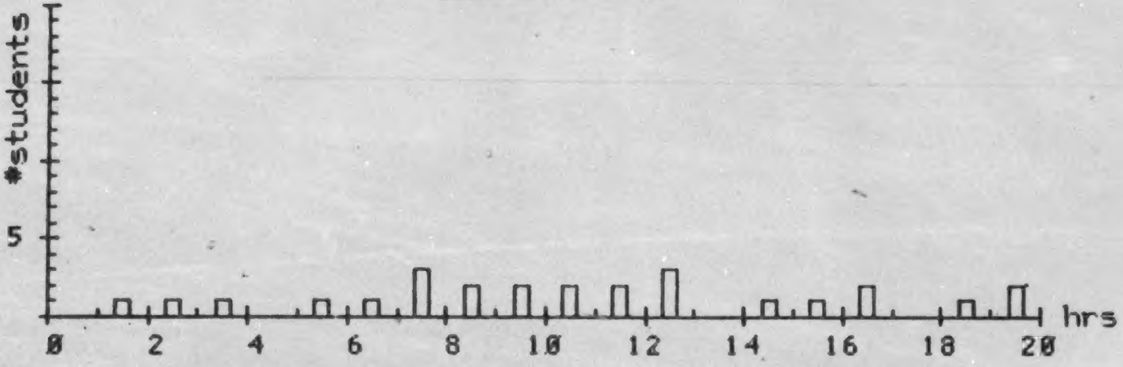
28 students, 227 hours. Average: 8.1

COLLEGE III - 102



33 students, 273 hours. Average: 8.3

COLLEGE III - 112

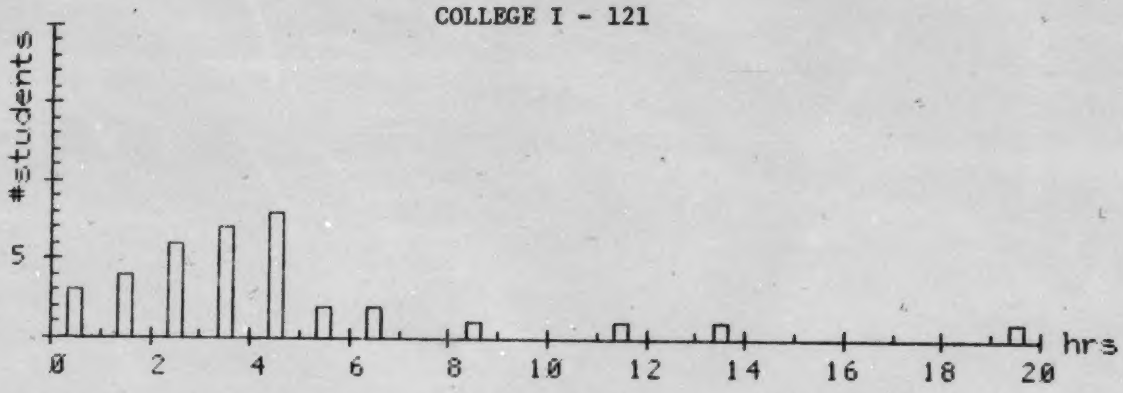


26 students, 275 hours. Average: 10.6

Figure 2.2.1d

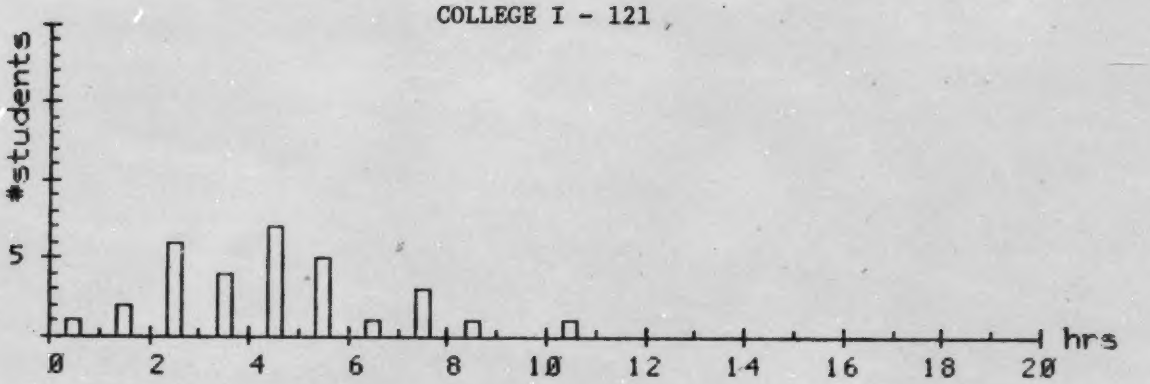
Histograms of Student Usage in Fall 1975 Chemistry 101/121/201 Classes

COLLEGE I - 121



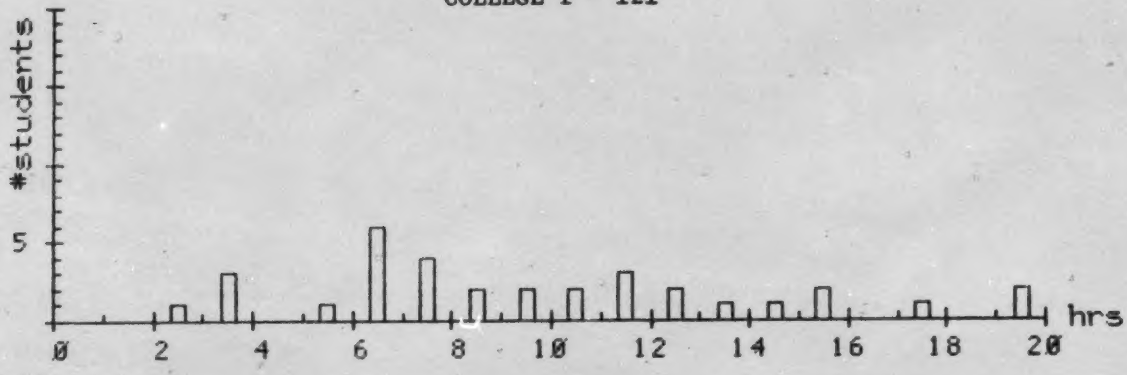
36 students, 143 hours. Average: 4.0

COLLEGE I - 121



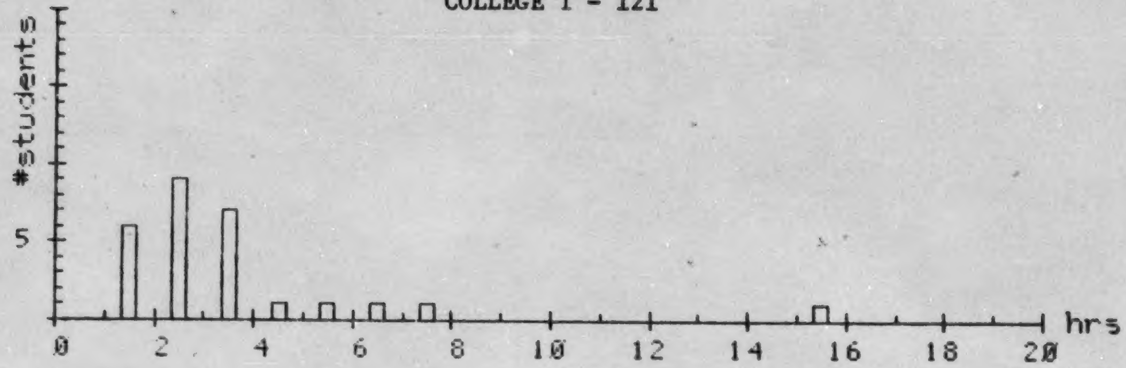
31 students, 124 hours. Average: 4.0

COLLEGE I - 121



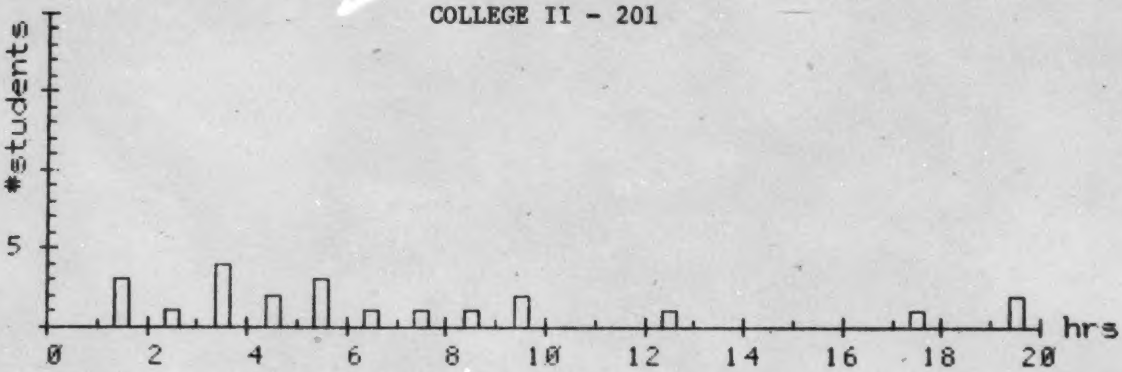
33 students, 309 hours. Average: 9.4

COLLEGE I - 121



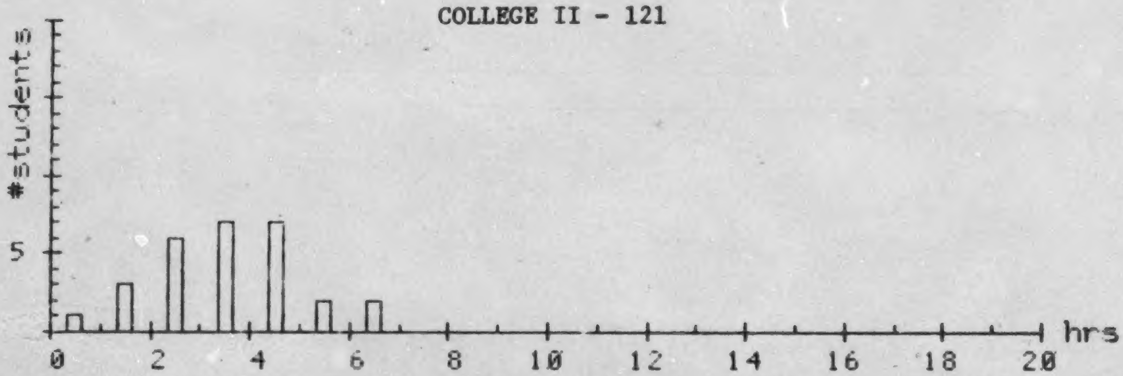
27 students, 82 hours. Average: 3.0

COLLEGE II - 201



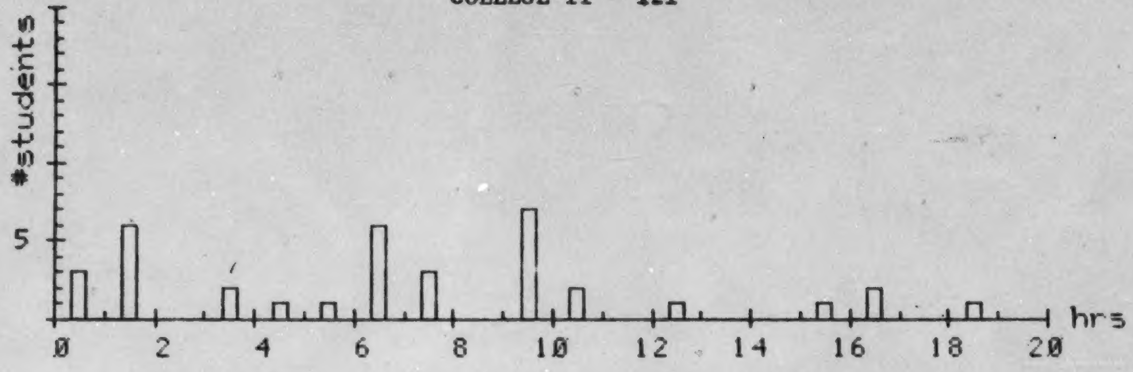
22 students, 188 hours. Average: 8.5

COLLEGE II - 121



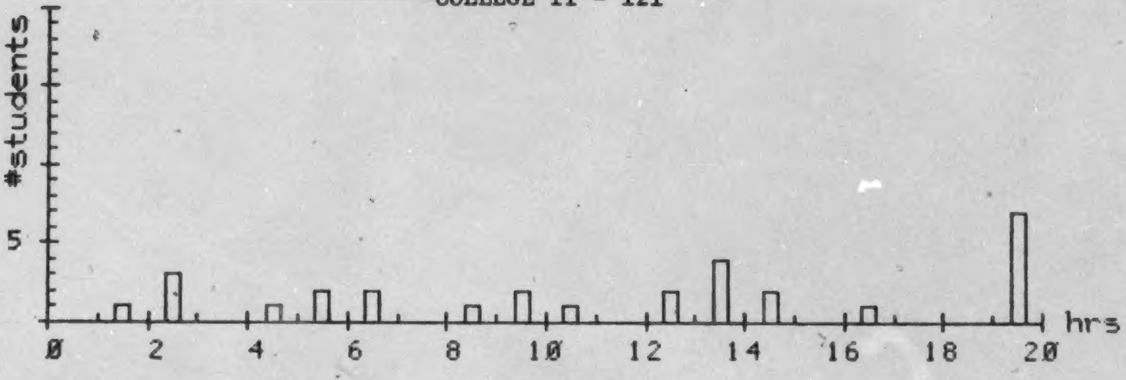
28 students, 86 hours. Average: 3.1

COLLEGE II - 121



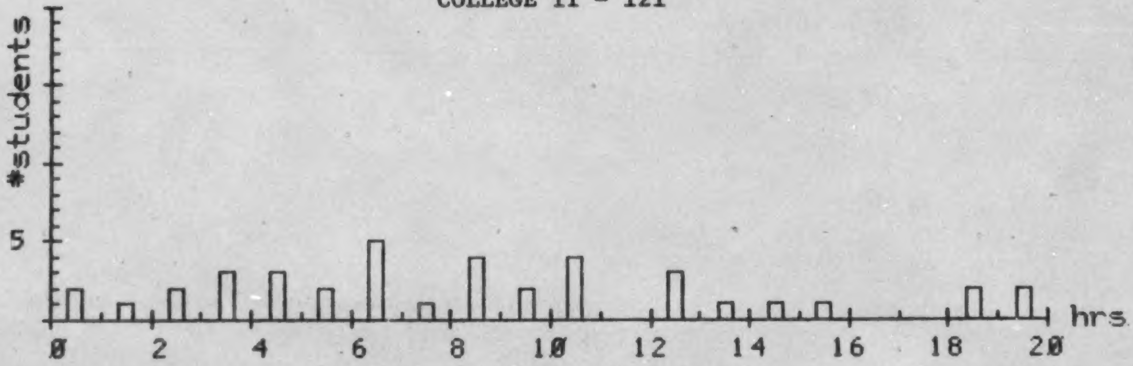
36 students, 238 hours. Average: 6.6

COLLEGE II - 121



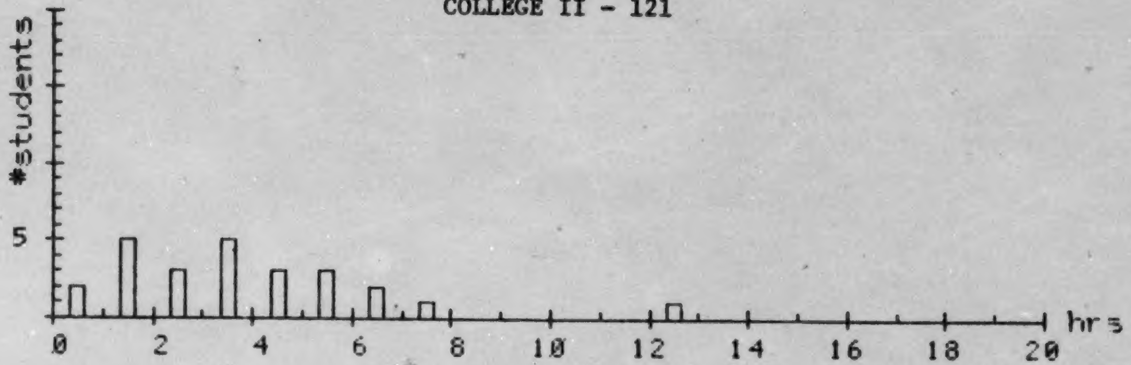
29 students, 342 hours. Average: 11.8

COLLEGE II - 121



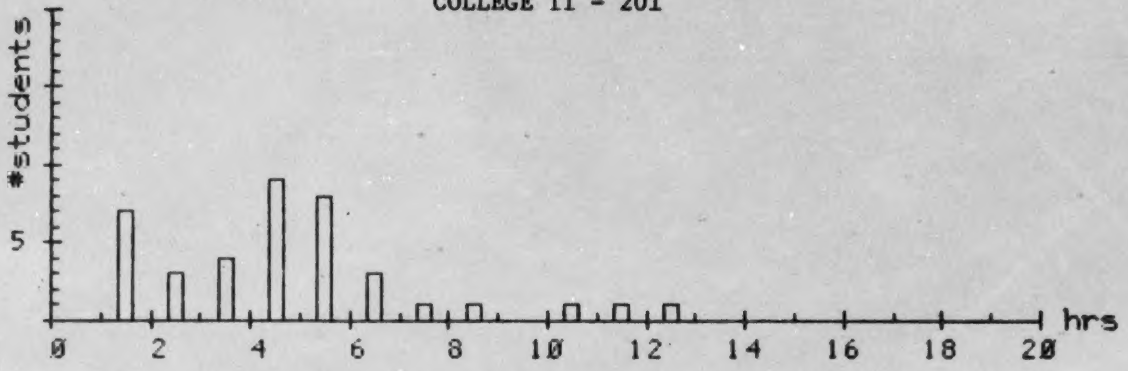
39 students, 318 hours. Average: 8.2

COLLEGE II - 121



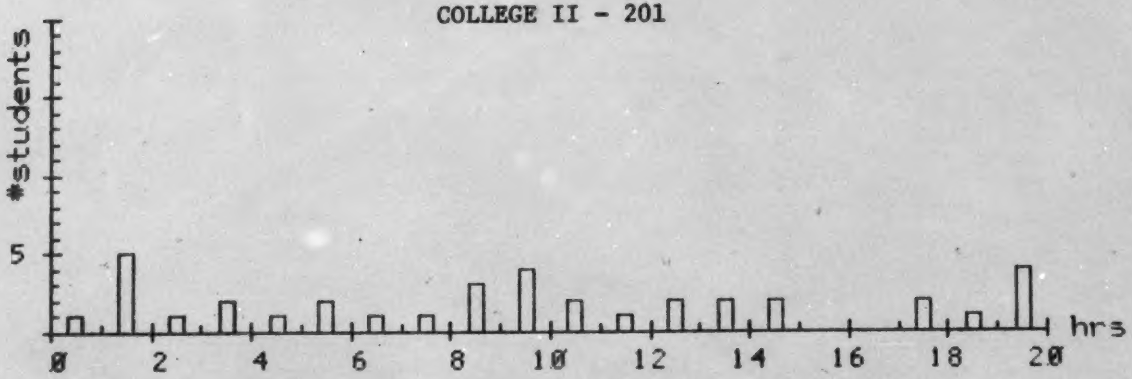
25 students, 84 hours. Average: 3.4

COLLEGE II - 201



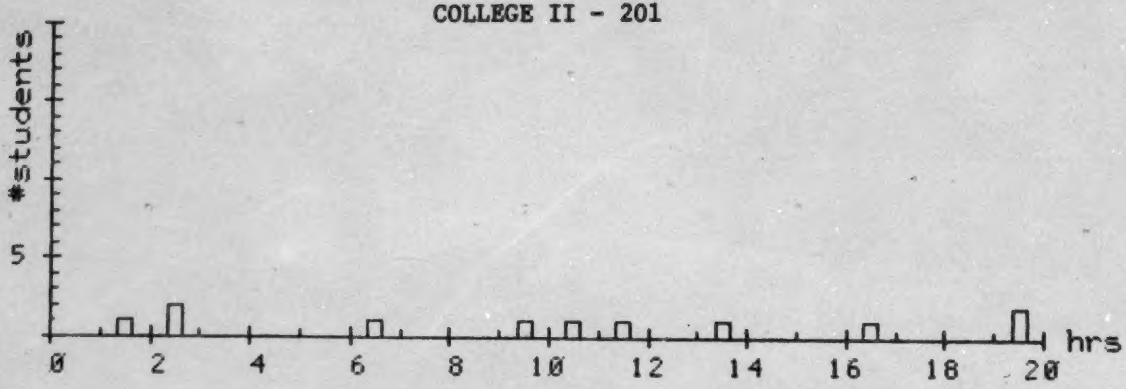
39 students, 167 hours. Average: 4.3

COLLEGE II - 201



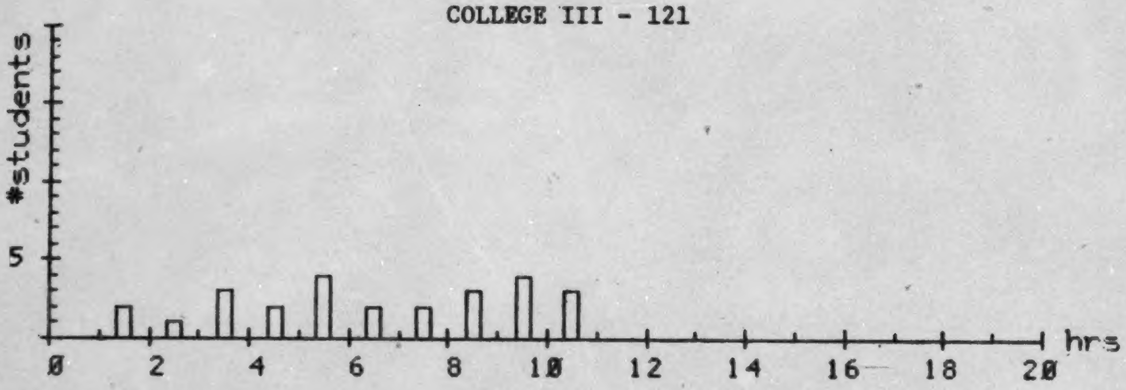
37 students, 351 hours. Average: 9.5

COLLEGE II - 201



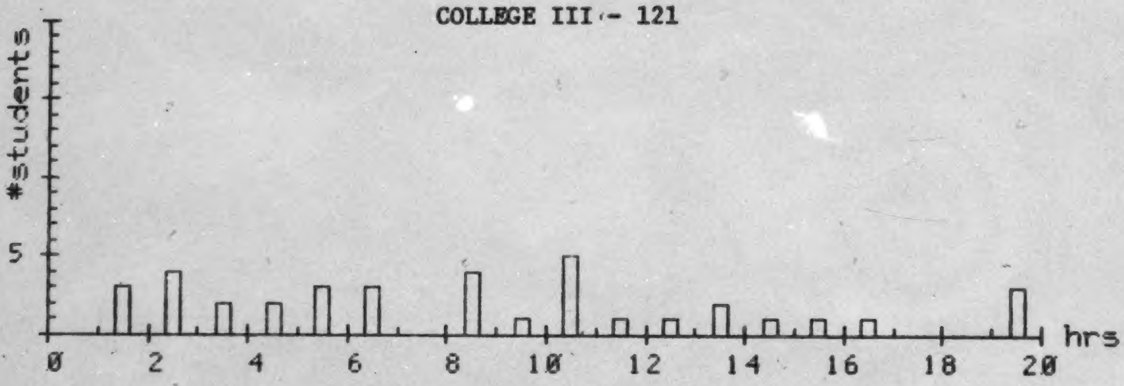
11 students, 111 hours. Average: 10.1

COLLEGE III - 121



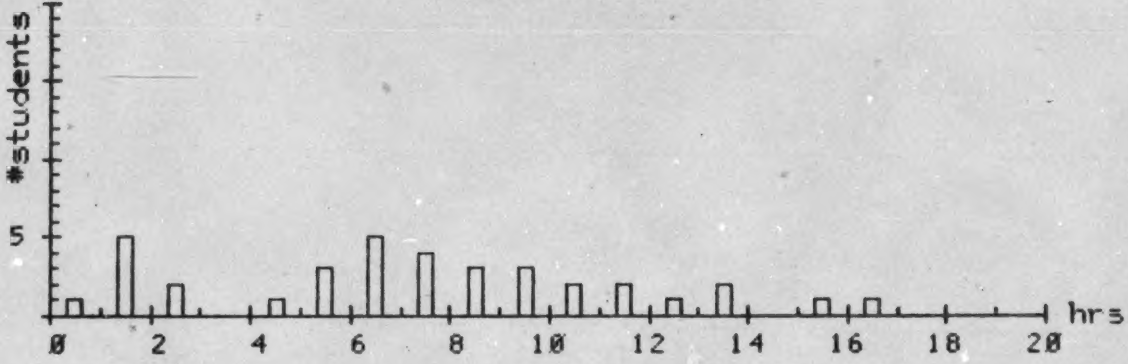
26 students, 157 hours. Average: 6.0

COLLEGE III - 121



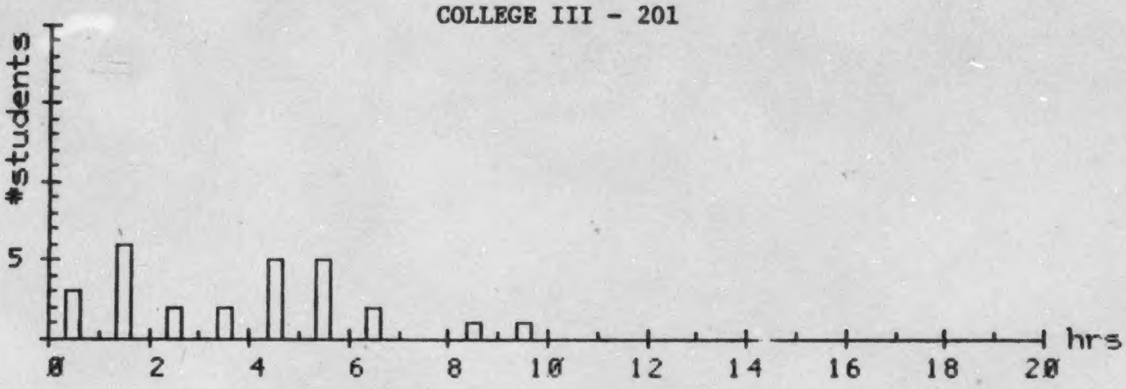
37 students, 324 hours. Average: 8.8

COLLEGE III - 121



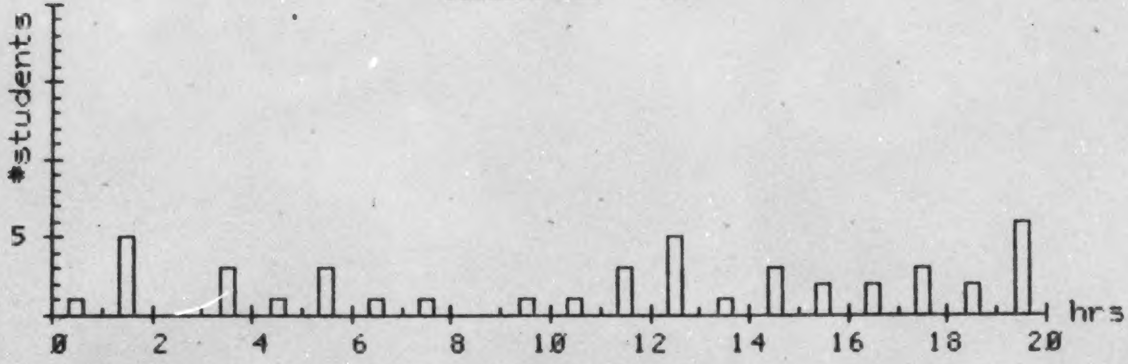
36 students, 248 hours. Average: 6.9

COLLEGE III - 201



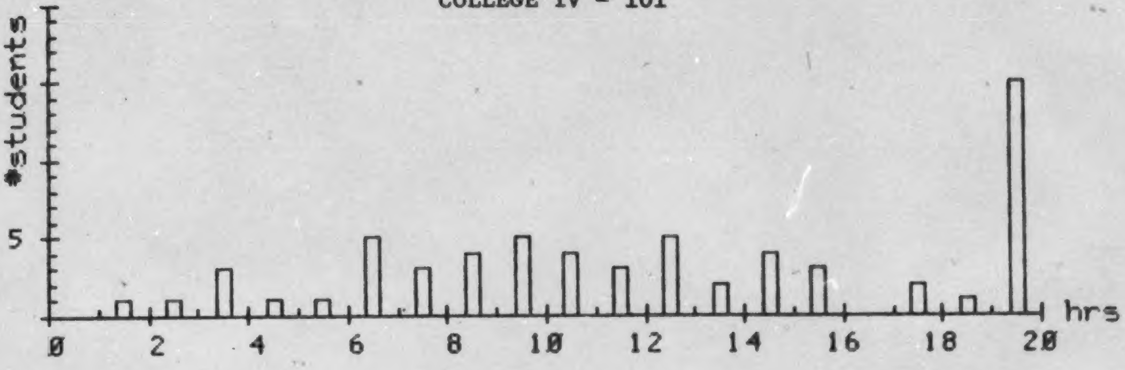
27 students, 90 hours. Average: 3.3

COLLEGE III - 201



44 students, 492 hours. Average: 11.2

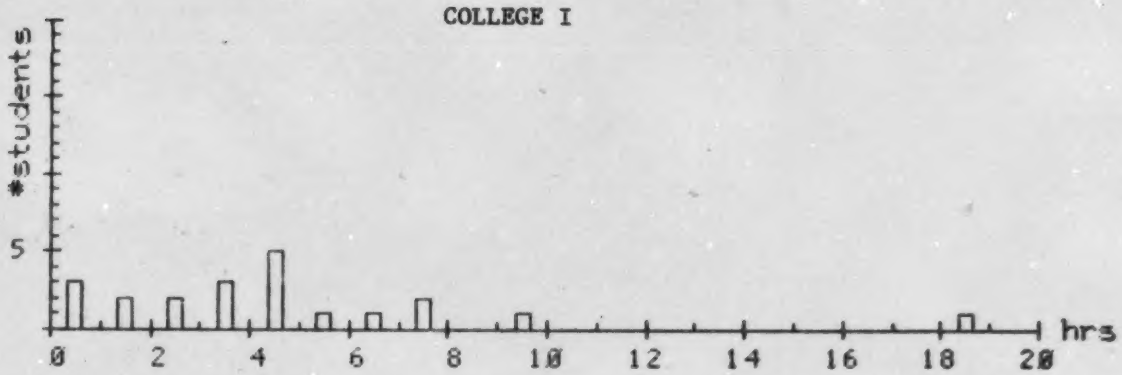
COLLEGE IV - 101



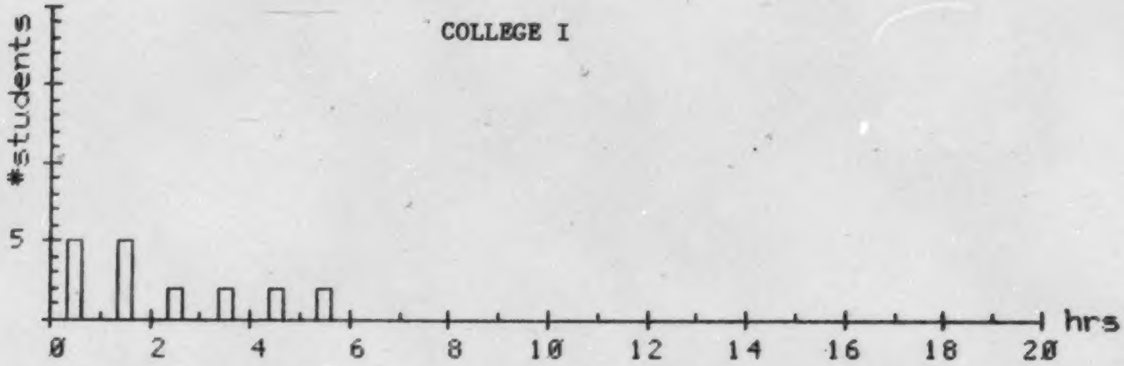
63 students, 787 hours. Average: 12.5

Figure 2.2.1e

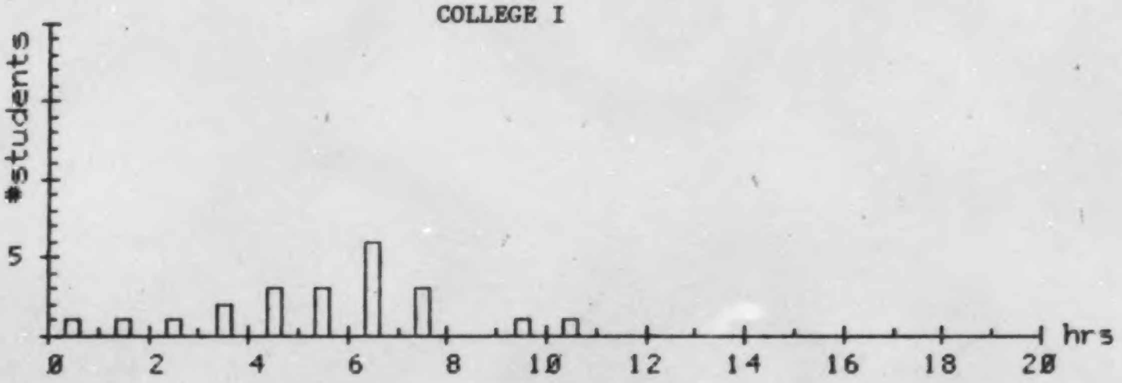
Histograms of Student Usage in Fall 1975 English 099/100/101 Classes



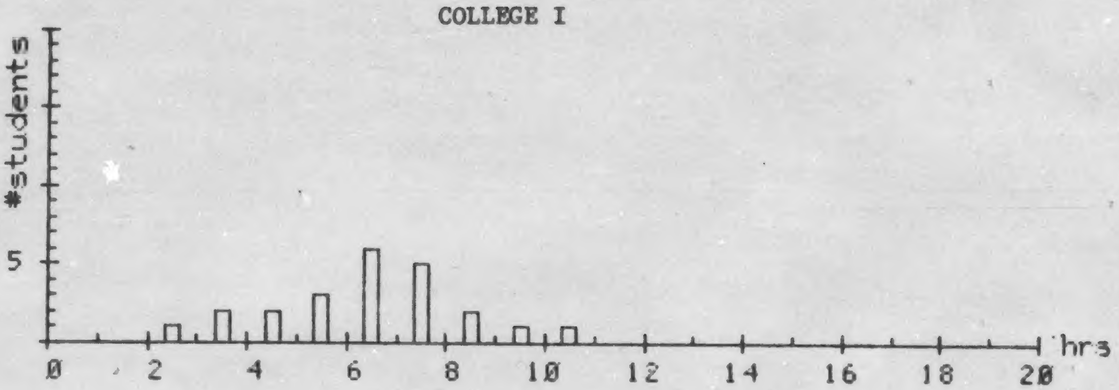
21 students, 87 hours. Average: 4.1



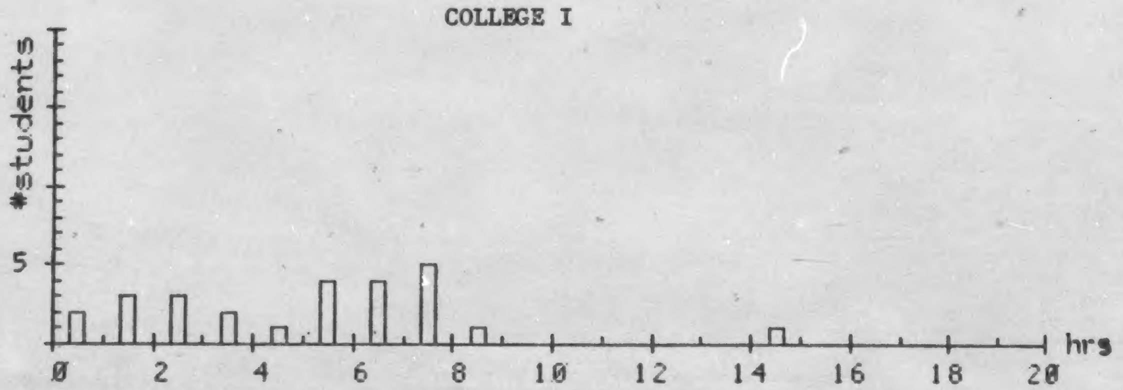
18 students, 33 hours. Average: 1.8



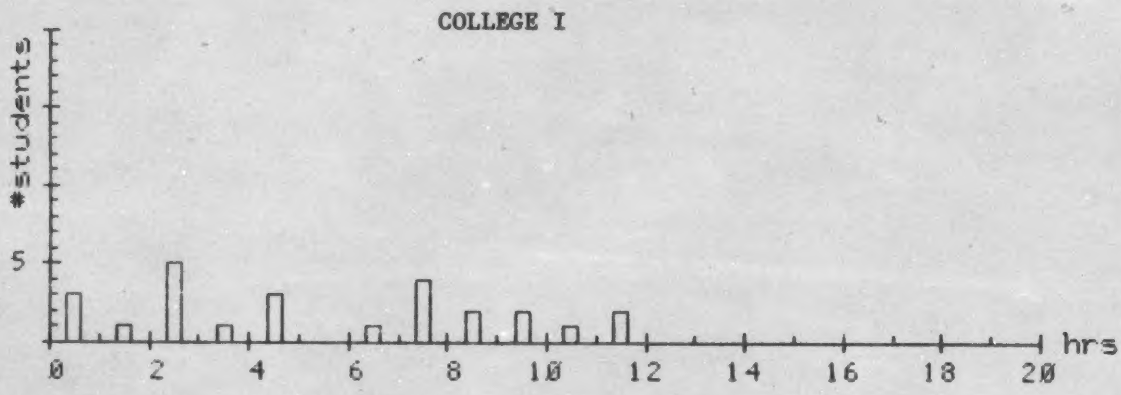
22 students, 112 hours. Average: 5.1



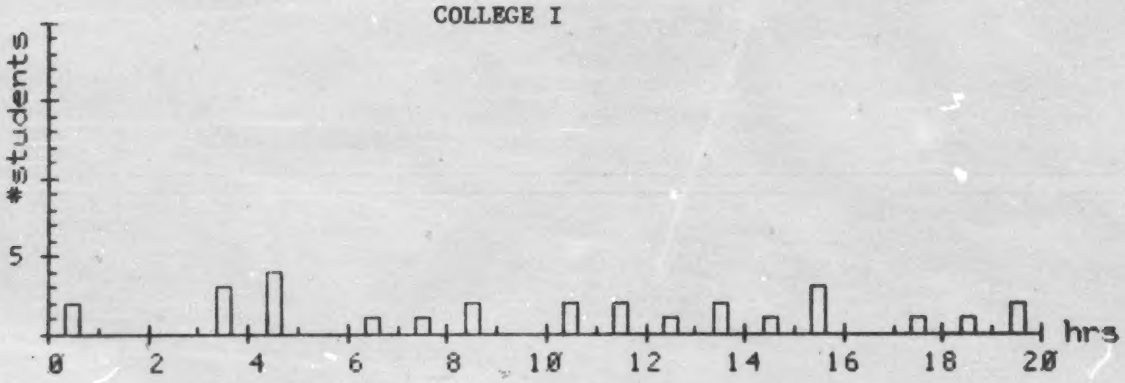
23 students, 137 hours. Average: 6.0



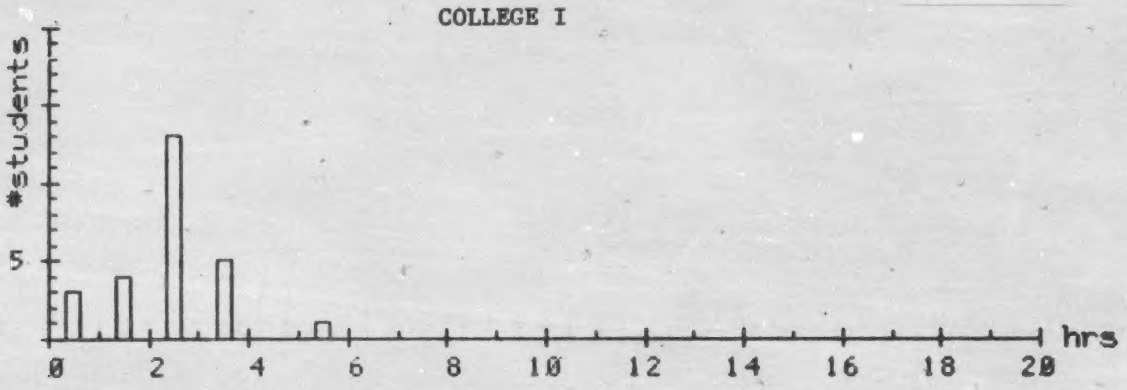
26 students, 120 hours. Average: 4.6



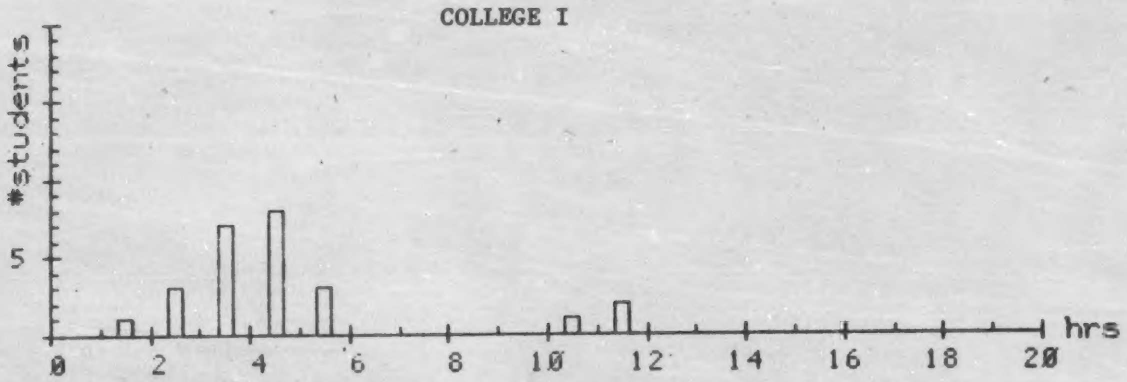
25 students, 126 hours. Average: 5.0



28 students, 274 hours. Average: 9.8

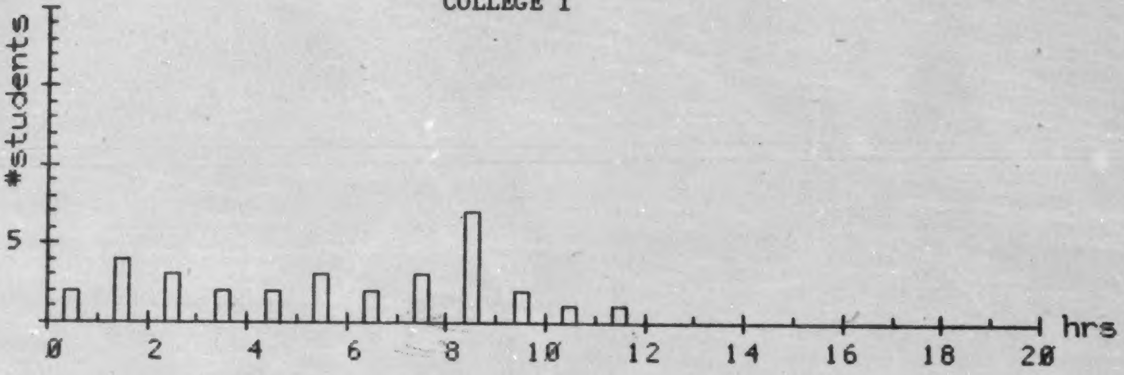


26 students, 50 hours. Average: 1.9



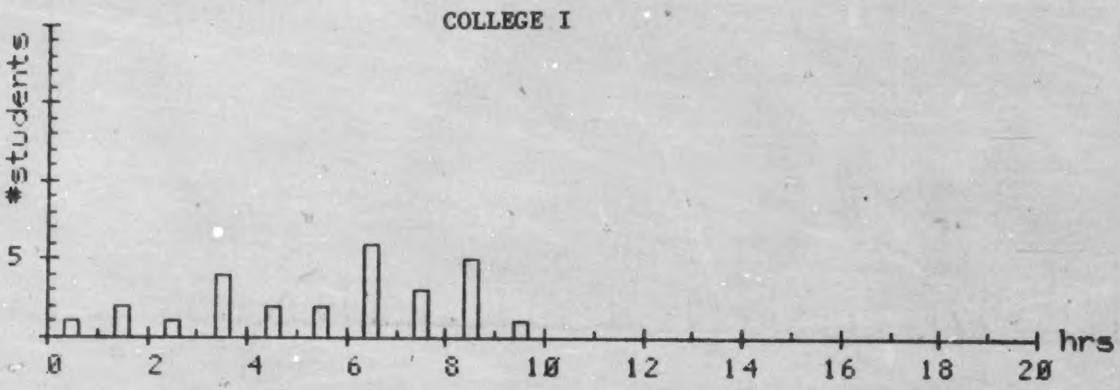
25 students, 107 hours. Average: 4.3

COLLEGE I



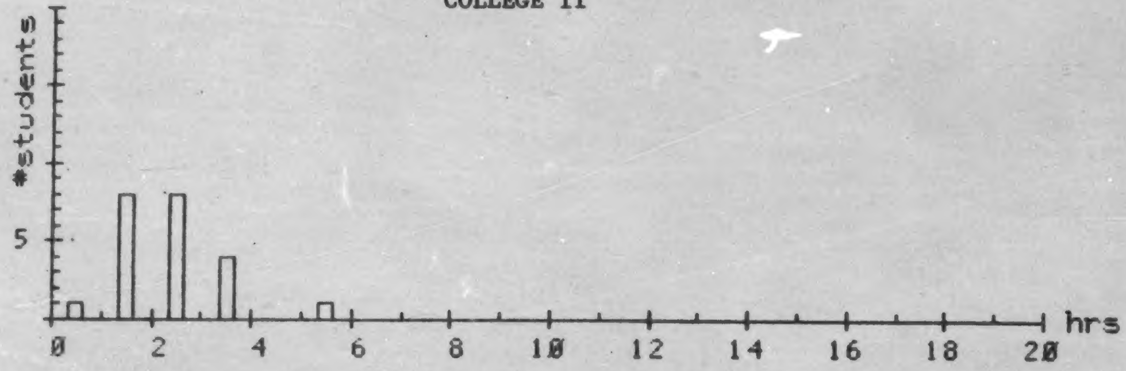
32 students, 167 hours. Average: 5.2
(2 sections)

COLLEGE I



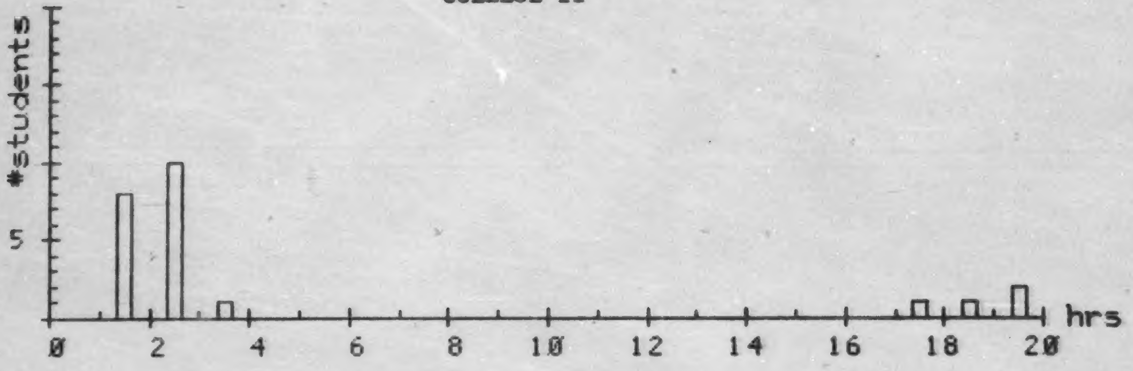
27 students, 140 hours. Average: 5.2

COLLEGE II



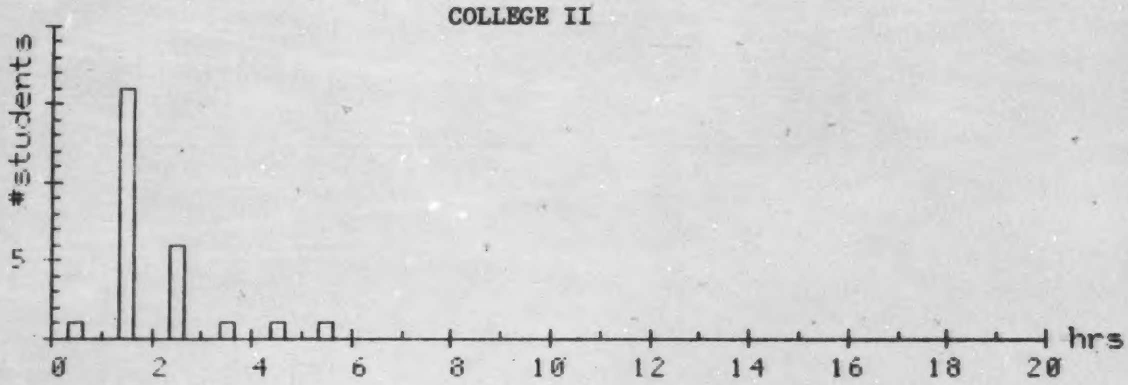
22 students, 41 hours. Average: 1.9

COLLEGE II



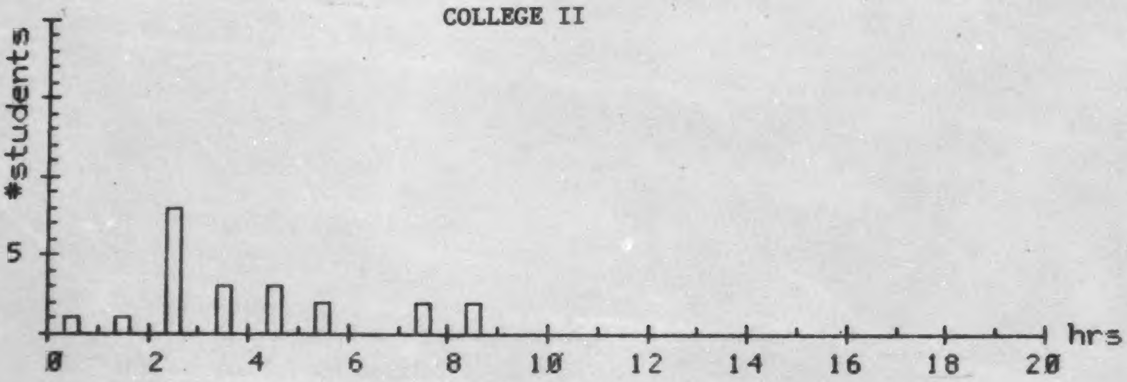
23 students, 109 hours. Average: 4.7

COLLEGE II

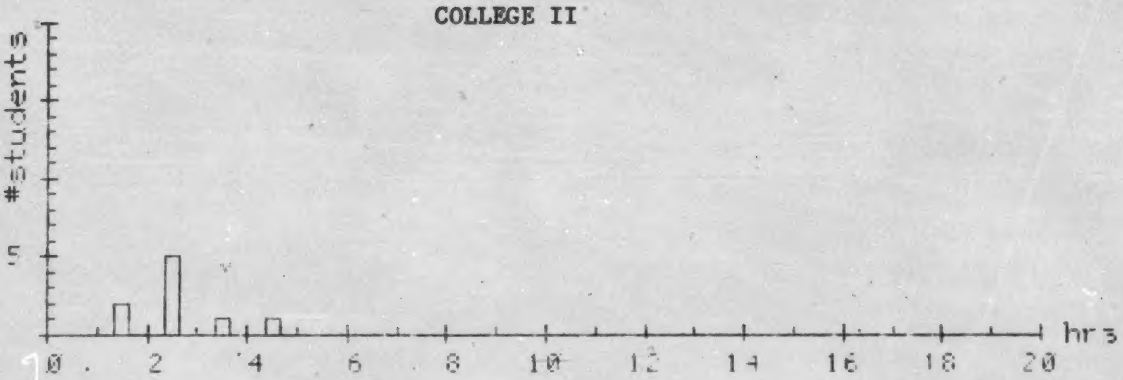


26 students, 40 hours. Average: 1.5

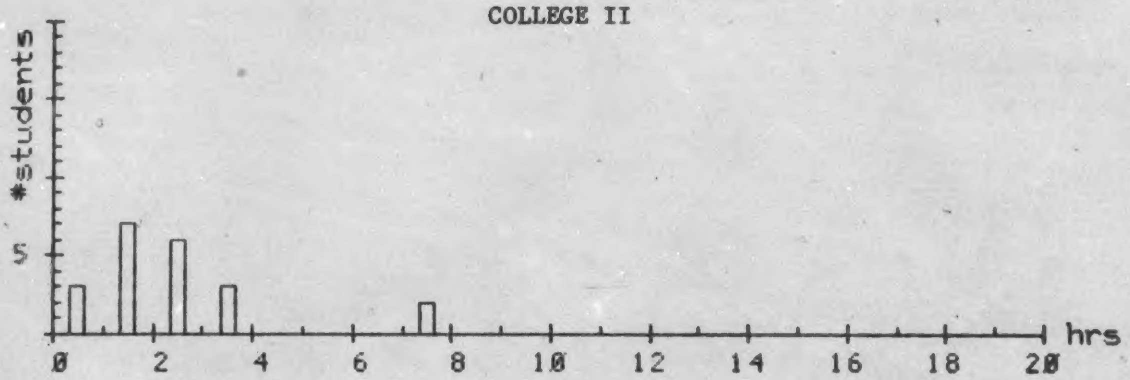
COLLEGE II



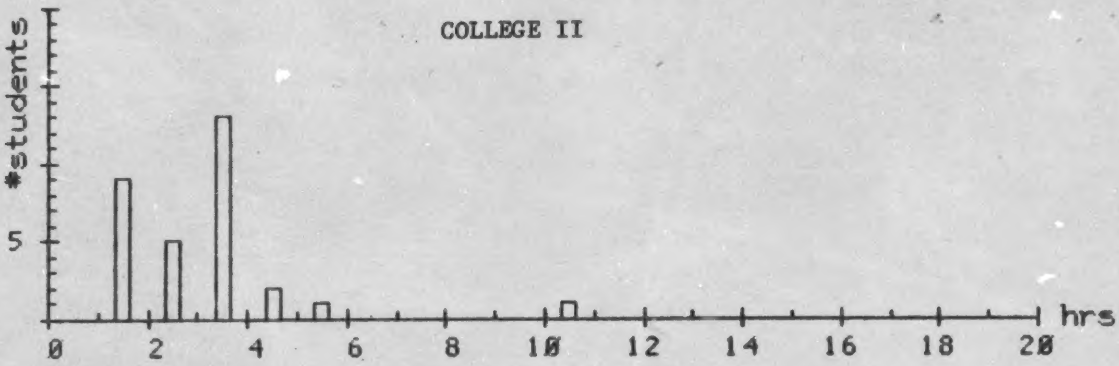
22 students, 78 hours. Average: 3.5


COLLEGE II

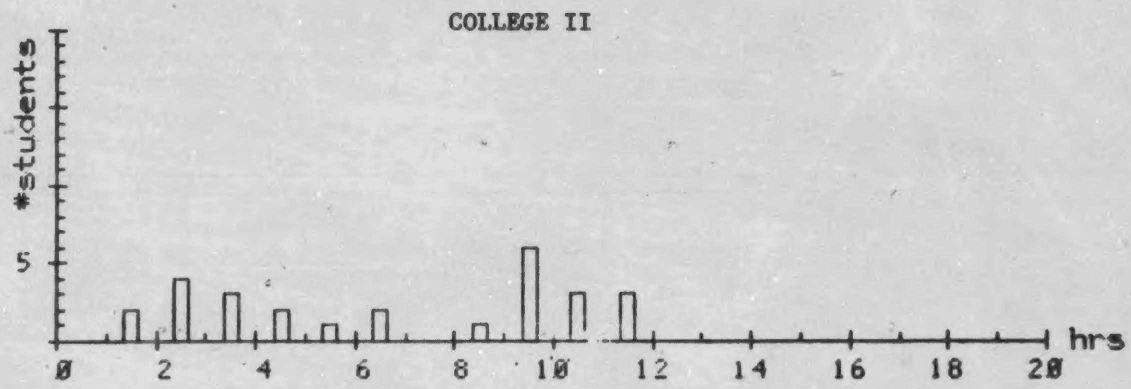
9 students, 19 hours. Average: 2.1


COLLEGE II

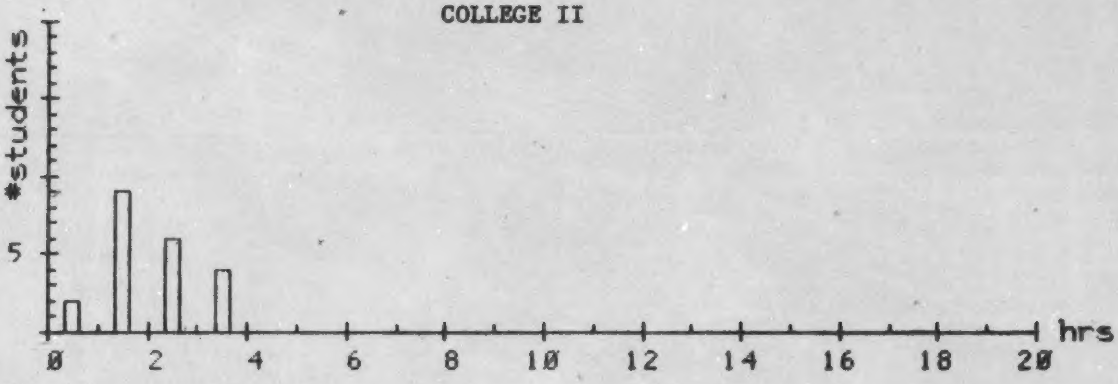
21 students, 42 hours. Average: 2.0


COLLEGE II

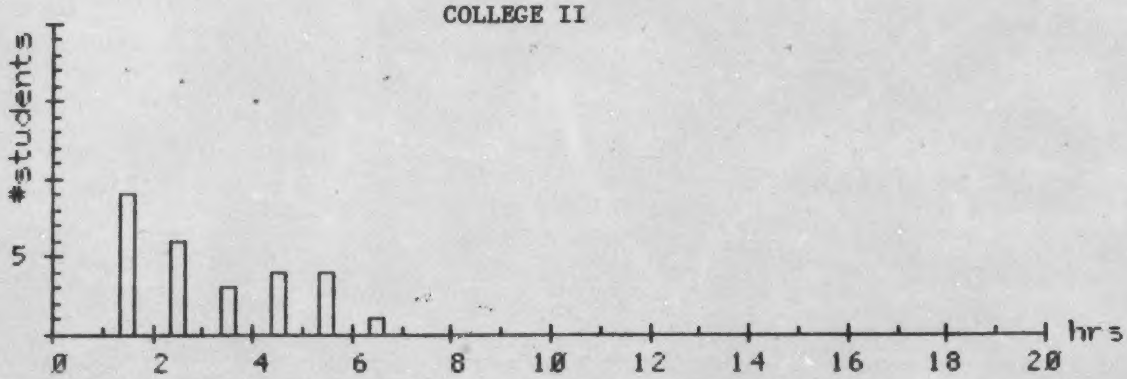
31 students, 81 hours. Average: 2.6



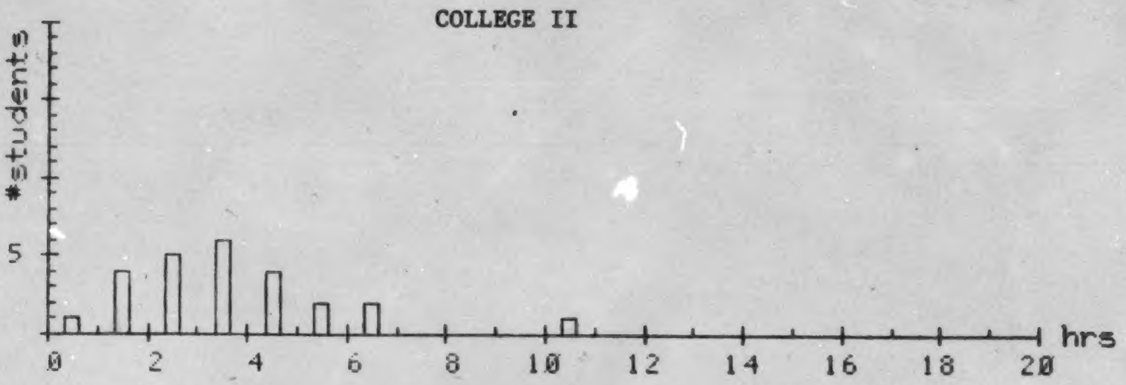
27 students, 169 hours. Average: 6.3



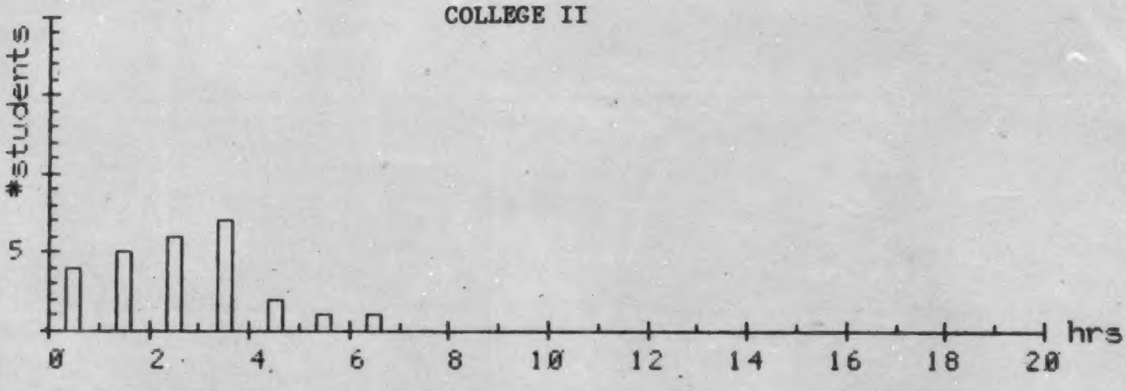
21 students, 33 hours. Average: 1.6



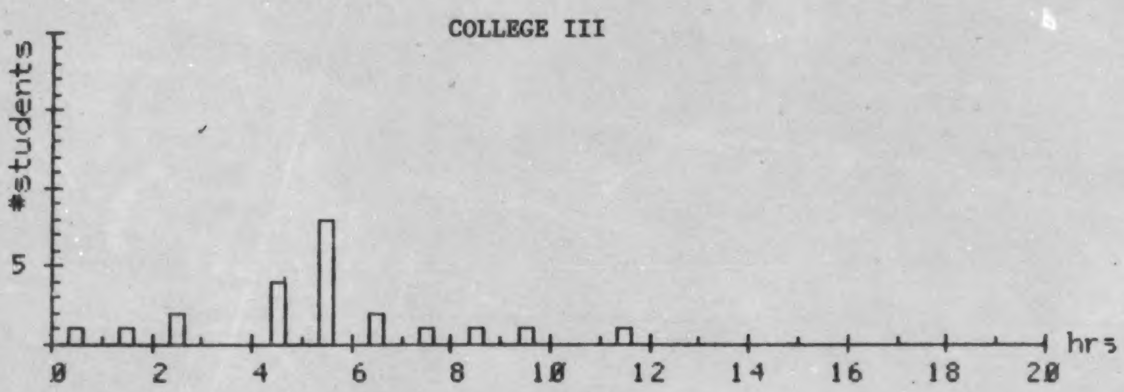
27 students, 72 hours. Average: 2.7



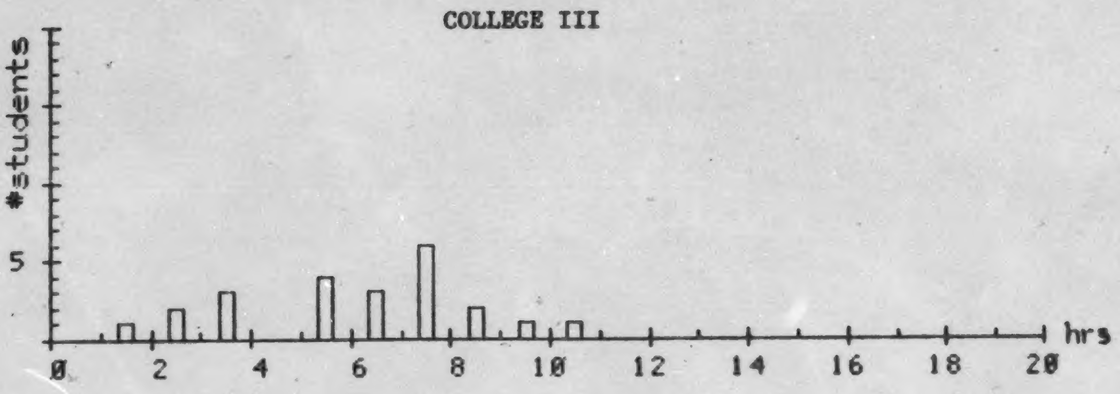
25 students, 80 hours. Average: 3.2



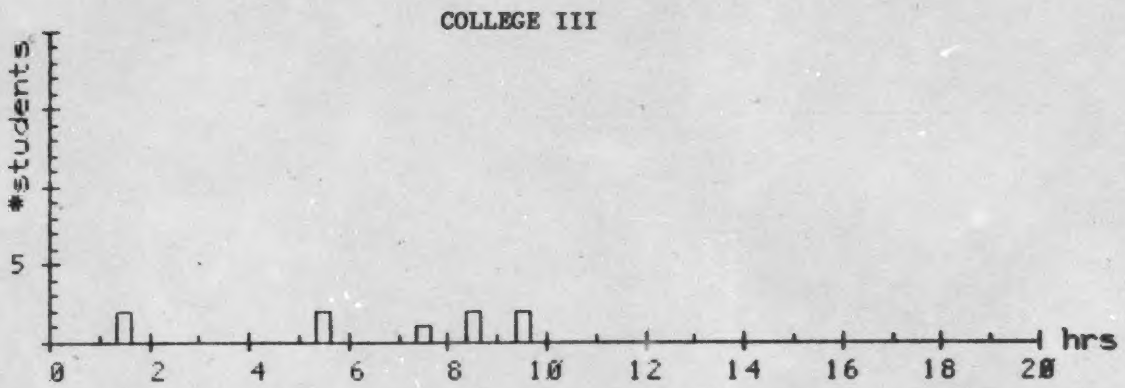
26 students, 57 hours. Average: 2.2



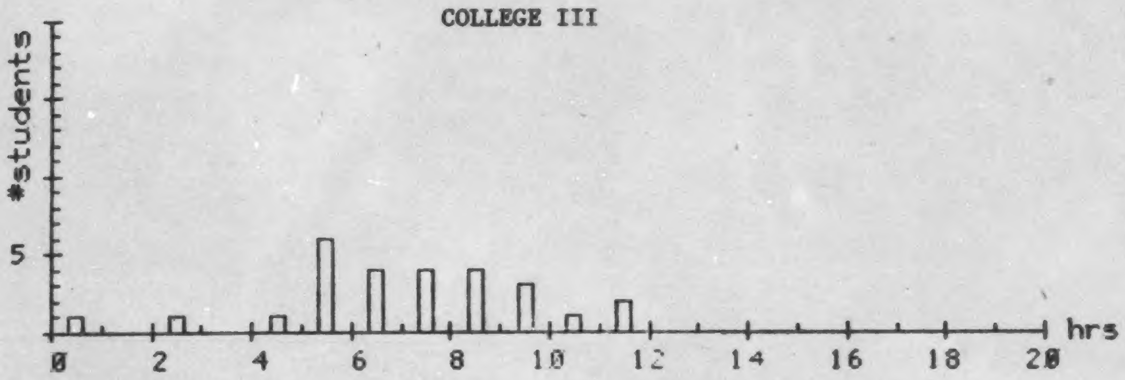
22 students, 108 hours. Average: 4.9


COLLEGE III

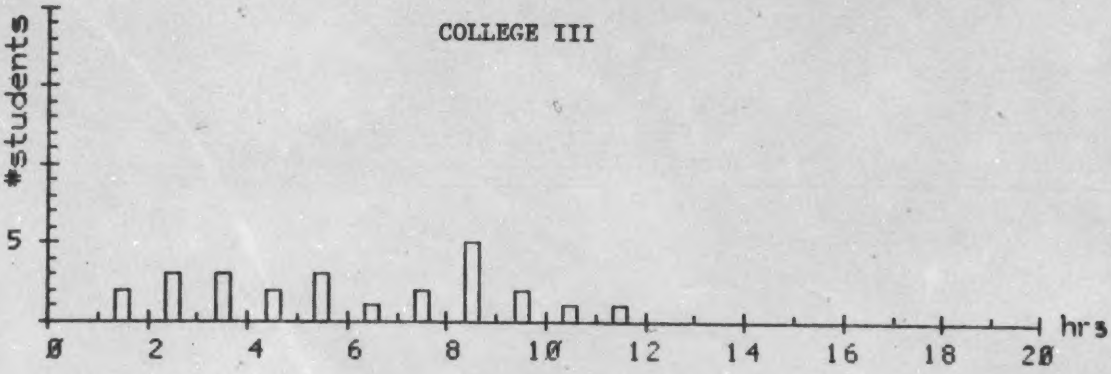
23 students, 129 hours. Average: 5.6


COLLEGE III

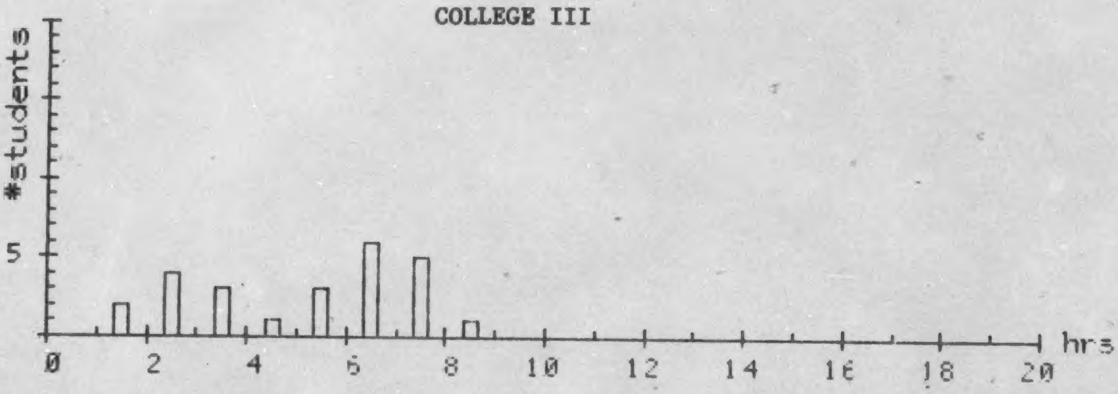
9 students, 53 hours. Average: 5.9


COLLEGE III

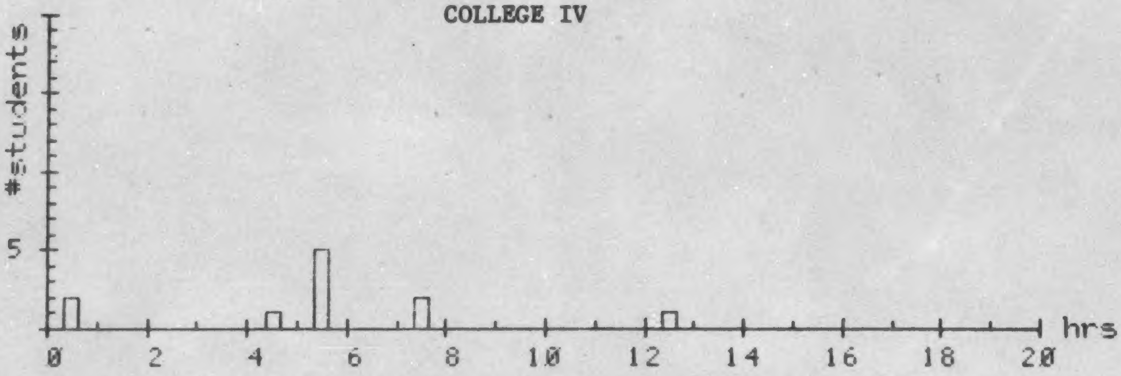
27 students, 179 hours. Average: 6.6


COLLEGE III

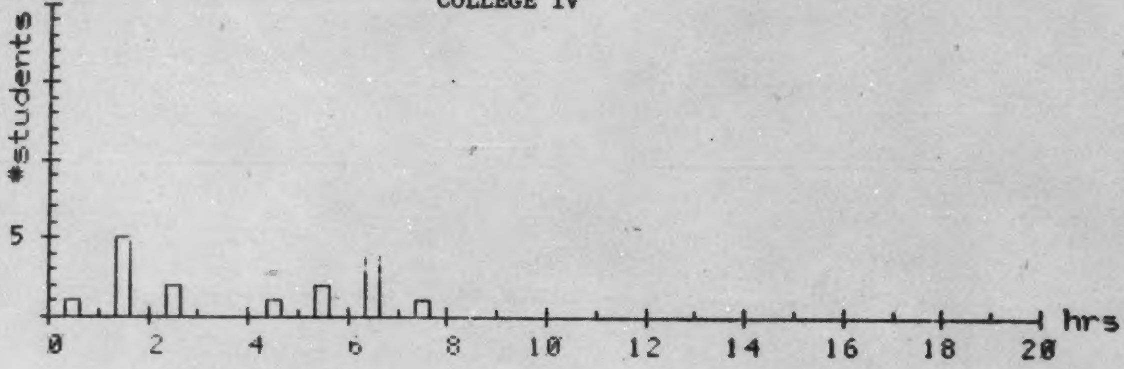
25 students, 139 hours. Average: 5.6


COLLEGE III

25 students, 117 hours. Average: 4.7

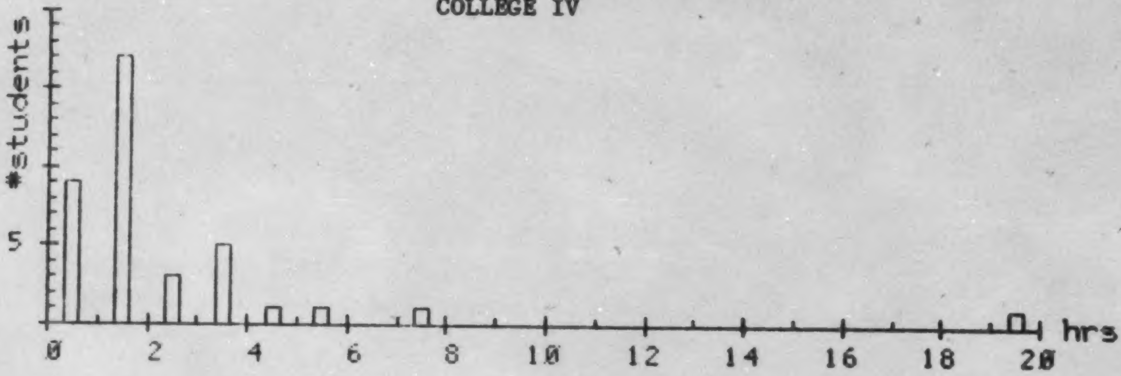

COLLEGE IV

11 students, 55 hours. Average: 5.0



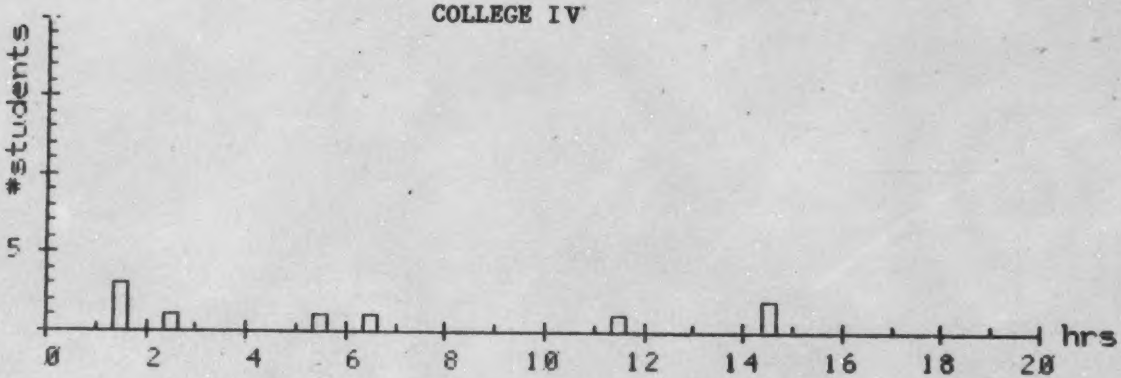
COLLEGE IV

16 students, 54 hours. Average: 3.4



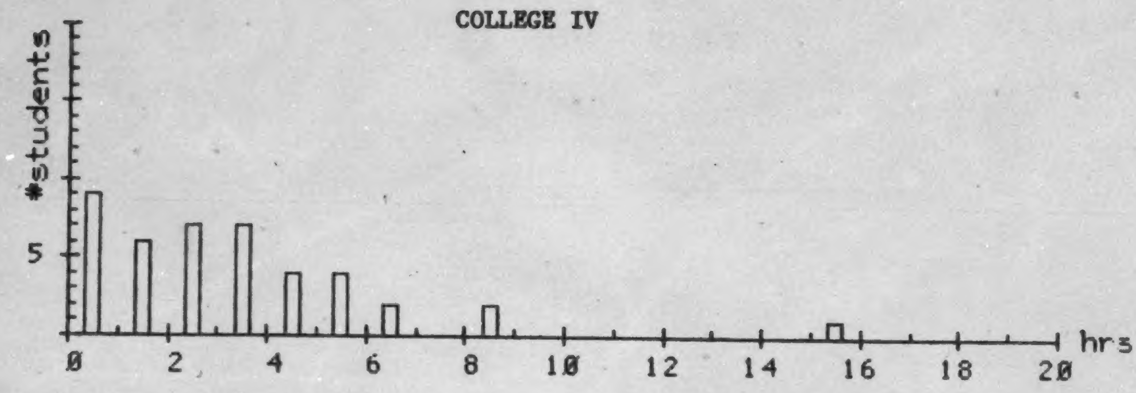
COLLEGE IV

38 students, 73 hours. Average: 1.9

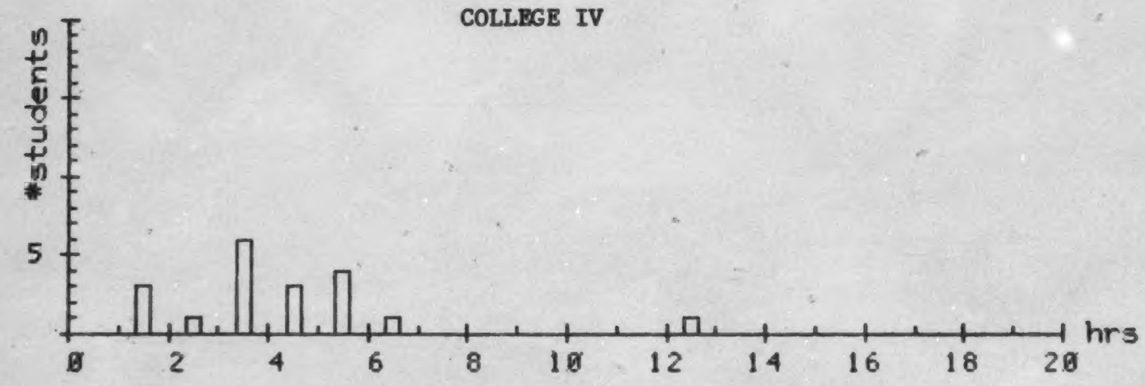


COLLEGE IV

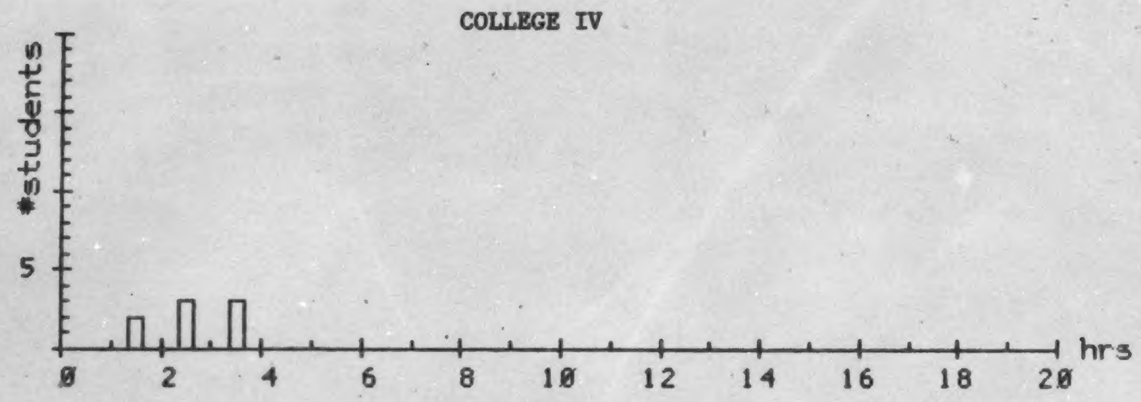
9 students, 55 hours. Average: 6.1


COLLEGE IV

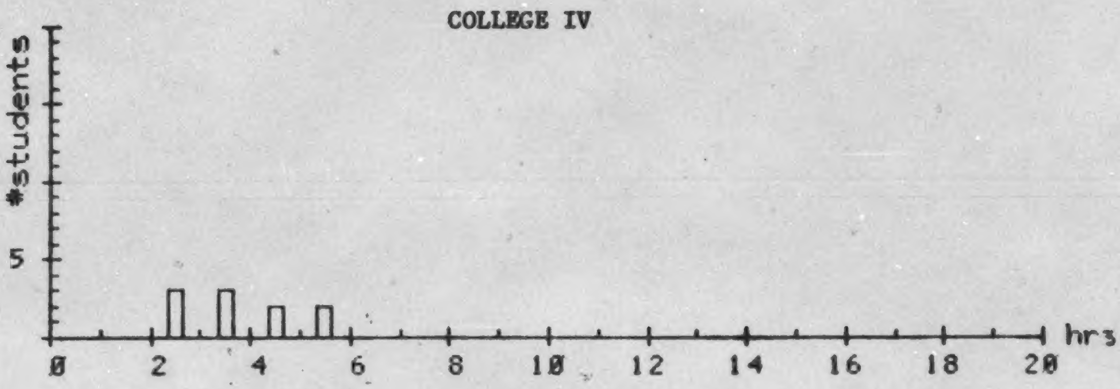
42 students, 120 hours. Average: 2.9


COLLEGE IV

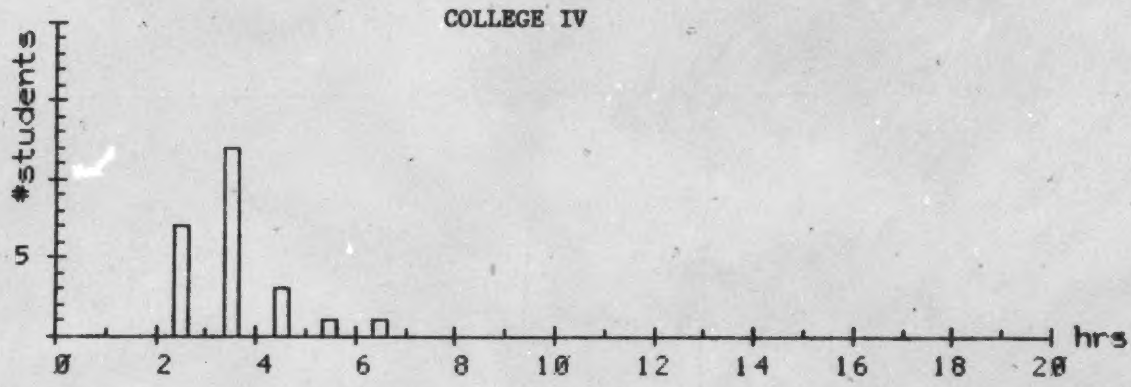
19 students, 73 hours. Average: 3.8


COLLEGE IV

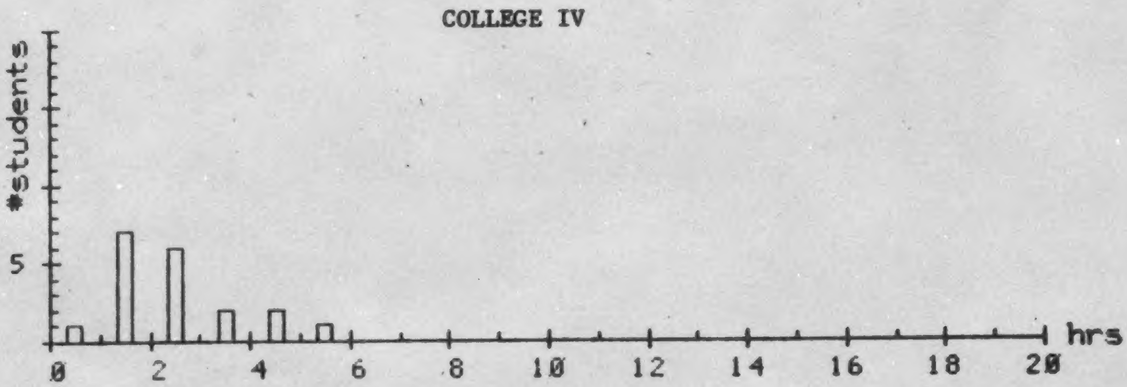
8 students, 17 hours. Average: 2.1



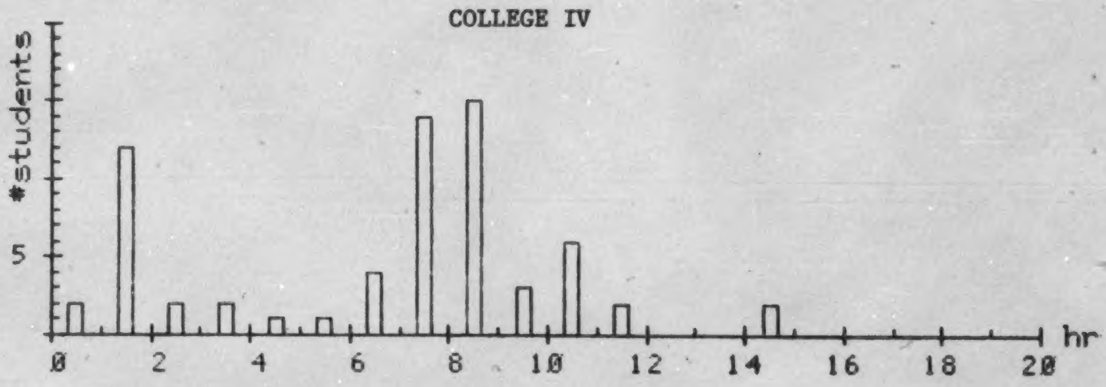
10 students, 33 hours. Average: 3.3



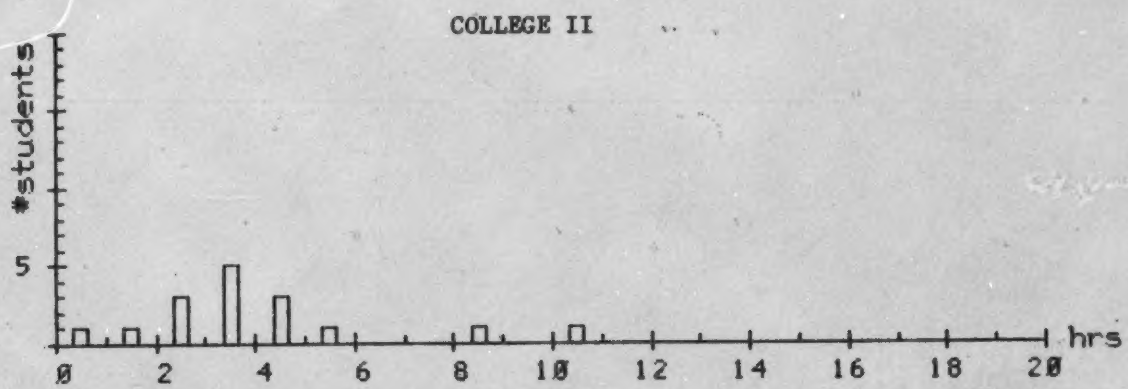
24 students, 73 hours. Average: 3.0



19 students, 38 hours. Average: 2.0



66 students, 410 hours. Average: 6.2
(2 sections)

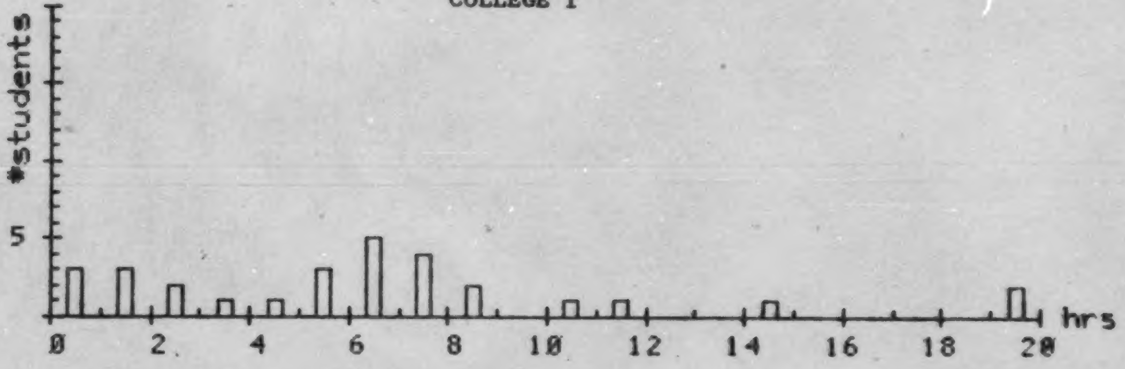


16 students, 57 hours. Average: 3.6

Figure 2,2.1f

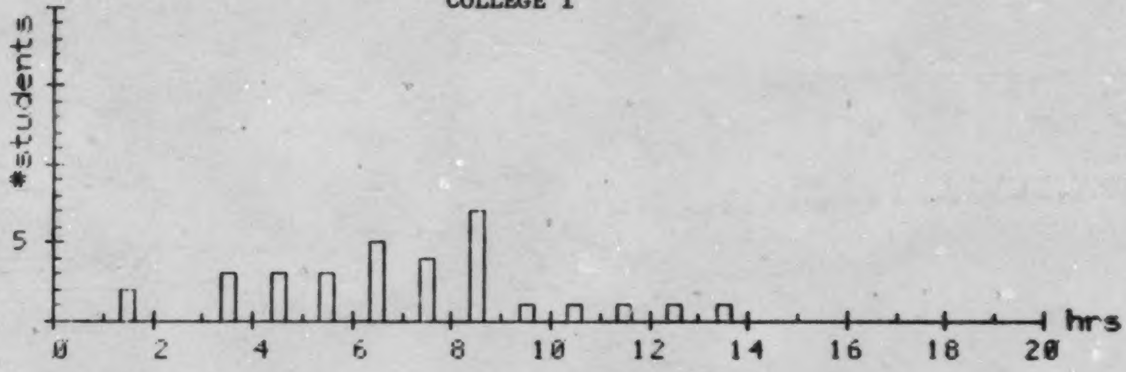
Histograms of Student Usage in Fall 1975 Mathematics 111 Classes

COLLEGE I



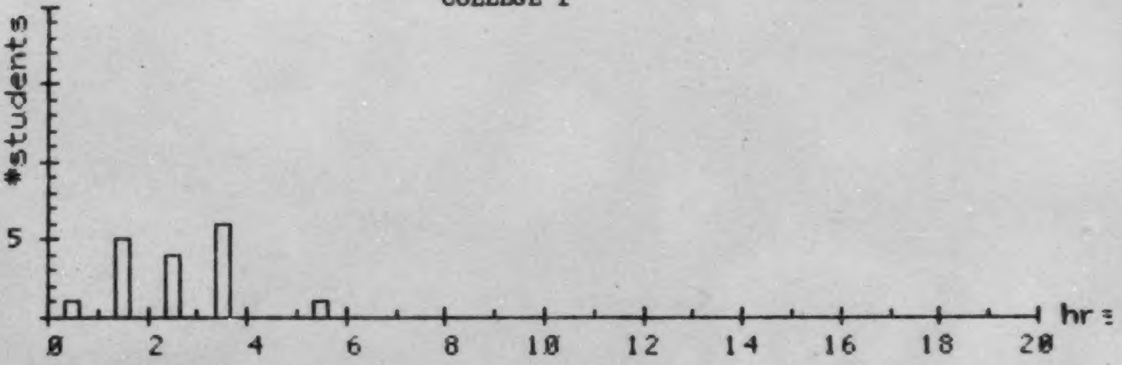
29 students, 178 hours. Average: 6.1

COLLEGE I

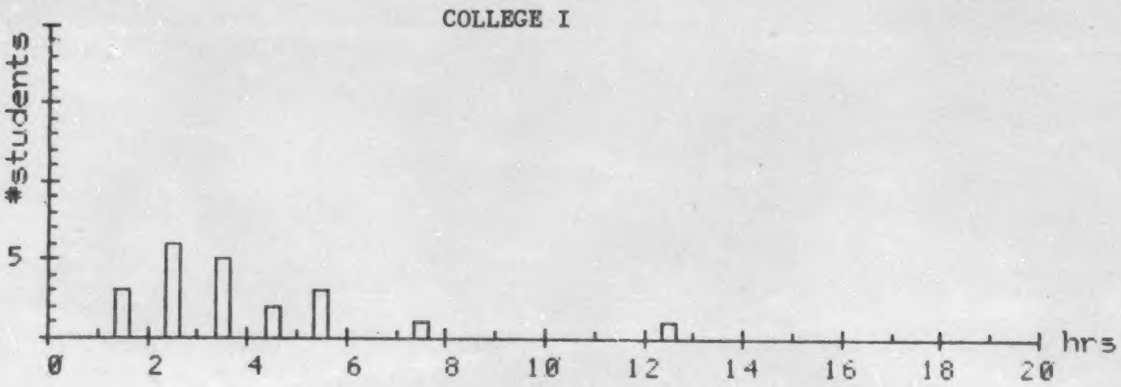


32 students, 207 hours. Average: 6.5

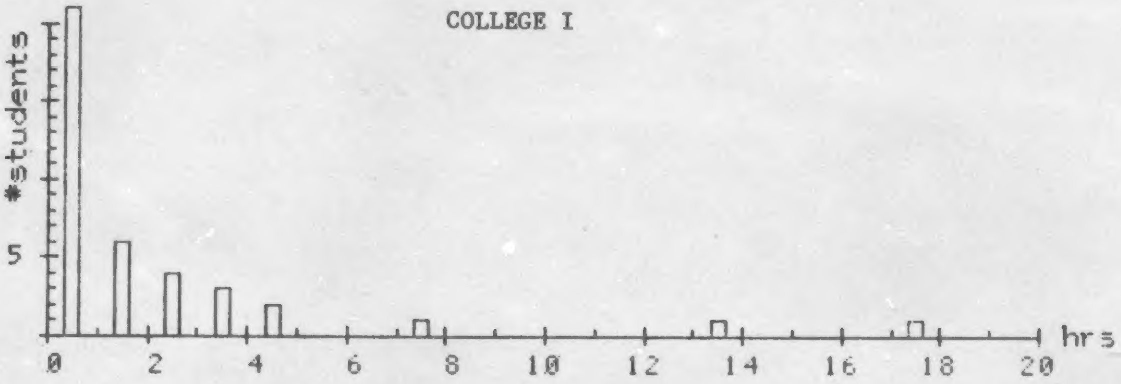
COLLEGE I



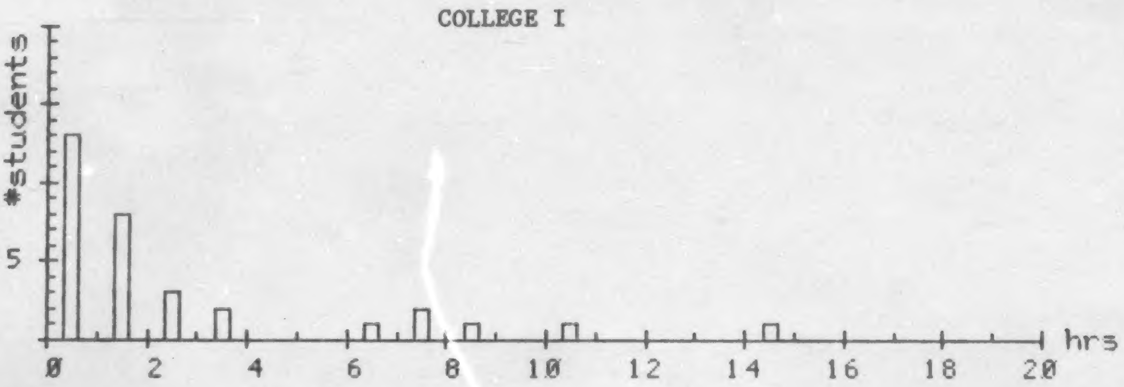
17 students, 36 hours. Average: 2.1



21 students, 72 hours. Average: 3.4



39 students, 68 hours. Average: 1.7



32 students, 72 hours. Average: 2.3

Table 2.2.4a

Student Use of Lessons in Eight Business 101 Classes
Fall 1975

	College							
Lesson	I	II	III	III	III	III	III	IV
OM	3	1	3	4	5	5	4	6
47	1	2	2	3	2	2	1	18
03	34							26
04	30	26	13	25	7	11	14	23
05	29	31	26	28	18	22	18	20
06	28	25	22	28	8	24	29	20
07		4		1	1	2	2	13
08	22	18	6	26	11	9	14	8
48	8		19	25	3	19	13	8
09	19	12	1	19	4	10	4	10
10	8	10			2			8
11	20	16	22	24	7	25	23	11
12		1		7	3	4	3	7
13	17	11	13	22	22	25	15	15
14		3		3	2	3		22
15		9	14	20	11	22	16	11
16		10	12	19	9	19	14	7
17		9				1		6
18				1	1	1		1
19				5	1	3	2	13
20		10	1	15	4	3	5	16
21		12	1	21	5	8	6	22
22		2		1		1		5
23		1				1		3
24					1			4
25			1					3
27				1		2	1	
28				1		2		
29								4
30					2	1	1	
32				1		1		
34				1			1	
35							1	
37				2	1		1	
40			1	2			1	
42			1	1		1		

Table 2.2.4b

Student Use of Lessons in Nine Biology 102/112 Classes
Fall 1975

Lesson	College I			College III					
	112	112	112	102	102	102	102	112	112
1A	11	20	14	16	15	19	27	15	20
1B		23		1			4	3	
1C					2		1		
1H									21
2C		26						1	
3A			1						
3C									1
4A		21		25	26		4	1	
4B	34	16	28			30	23	23	25
4C	14	17	16	22	24	26	22	22	25
4D		19		23	25		15	24	
4G			27			1			
4H							1		
5A	27			21	21				
5B				19	23	27	10	5	27
7A		1		22	16		6	8	1
7B				13	10			3	
7C		5		2	7	30	19	25	23
7D		3	6		1	10	6	3	4
7E	27	3	27	2	5		19	24	
7F	6	1	15		4		1		26
7G							13	16	
7H	18						18	22	
7L								4	
8A	6			3	11		17	10	
8B	8			1	7		2	5	
8C					4				
9A				7	11		21		22
9B				8	14				20
9C				6	13				21
9G	3								
9H	1								
9I	1								
10D							30	28	
13C	29		18	25	24	23	27	25	23

Table 2.2.4c
Student Use of Lessons in Three Chemistry 101 Classes
Fall 1975

Lesson	College IV	College IV	College IV
01	16	19	20
02	13	17	19
03	8	12	11
04	14	17	18
05	11	14	16
06	13	17	17
07	9	14	15
08	14	19	18
09	18	21	23
10	13	17	16
11	12	13	18
12	11	9	10
13	8	9	9
14	14	14	16
15	9	17	15
16	8	6	7
17	10	4	12
18	7	6	6
19	3	4	3
20	1	3	3
21	1	2	1

Table 2.2.4d

Student Use of Lessons in Six Mathematics 111 Classes
Fall 1975

Lesson	College I					
	111	111	111	111	111	111
1	11			4		
2	4			4		
3	25	11	29	21	7	5
4	28	25	11	21	11	5
5	24	15	7	13	5	
6	21	18	3	14	2	
7	23	18	7	15		23
8	15	6	1	3	1	1
9	15	11	5	9		4
10	6	8	3	4		1
11	6	8	5	5		1
12	6	8	2	5		1
13	4	8	3	6		1
14		8	1	5		1
15		8	1	3		1
16		8		3		1
17	10	11	4	8		4
18	1		1	3		
19	10	13	4	9		11
20	6	12	4	6		10
21	12			30		
22	23	19	11	12	7	
23	19		3	17	9	
24	2			2		
25	8	11	4	17	3	
26	7	3		11	1	1
27	4	3	4	3		
28	3	3	4	3		
29	3	3	4	2		
30	3	9	3	13		4
31	7	12	2	8		11
32	5	12	1	8		11
33	4	9		3		9
34	2	6		3		9
35	2	6		3		6
36	2	6		1		6
37	2	5		1		6
38	2	5		1		6
39	2	5		1		6
40	2	5		1		6
41	3	1	1	3		
42	2	5		6		
43	3	3	4	3		
44	3	3	4	3		
45	2		2	1		

Table 2.2.4d. Student Use of Lessons in Six Mathematics 111 Classes, Fall 1975 (cont.)

	College I					
Lesson	111	111	111	111	111	111
46	2	12	4	11		1
47	1		2	5		
48	1			4		
49	1			2		
50	2	3	3	3		
51	1			7		
52	1	3	3	3		
53	1	1	1	3		
54	1	3	3	3		
55	1	3	3	3		
56	1	3	3	3		
57	1	4	3	3		
58	1	3	3	3		
59	1	3	2	3		
60	1	3	1	3		
61	1	3	1	3		
62		9				
63		7	3	14	3	
64		9		2		
65		5				
66		1		6		
67			1	6		
68				15		
69				4		
70				5		
71				4		
72				1		
73				2		
74				2		
75				1		
76				2		
77				1		
78				1		
79				7		
80				1		
81						
82				4		
83				1		
84				1		

Table 2.2.5a

Minutes in Each Lesson by Students in One Class
College II: Business 101
Fall 1975

	Lesson																			
Student	OM	47	04	05	06	07	08	09	10	11	12	13	14	15	16	17	20	21	22	23
1	4	16	51	58	37			21	9	70		32	100	19	73	69	80	102	152	91
2		22	14	44	38	22		17	2	25		31	75	14	46	16	75	128		
3			66	111																
4			30	68	56															
5			37	100	107			96	2	159		108		38	174	296	162	56		
6			48	158	140			57	73	57		73		99	170	229	127	216	346	
7			64	44	65	31	2	45	2	231		61								
8				67																
9			36	61	85													43		
10				51																
11			28	62	49		10			198								194		
12			44	68	58	34				173								449		
13			80	56	124		32													
14			45	165	241												127			
15			45	77	95			40		122		70		23	59		224			
16			97	43	264		107	60	87	423		146		47	122	100	405	327		
17			3	74																
18					6															
19			66	28	127		104	35	22	359		50		33	64	4	22			
20			31	106	93		102	45	7	308		53		26	96	135	169	300		
21			32	81	41															
22			13	36	44			8	39	143	50	16		14	87	126	97	102		
23			51	38	38															
24				100																
25			84	27	13	33														
26			42	53	52		54	30	9	200		39			58					
27			75	123	78		35			63								86		
28			7	63	77		67			64								122		
29			74	16	106		98													
30			96	36	48		1			48										
31				36																

Table 2.2.5b

Minutes in Each Lesson by Students in One Class
College III: Business 101
Fall 1975

	Lesson																										
Student	**OM**	**47**	**04**	**05**	**06**	**07**	**08**	**48**	**09**	**11**	**12**	**13**	**14**	**15**	**16**	**18**	**19**	**20**	**21**	**22**	**27**	**28**	**32**	**34**	**37**	**40**	**42**
1			47	25	28	44		13	16		14	49		15	47			1	6	40			24		8		
2				74	67		71	47		138		62		37	56												
3			11	27	33			12	18	98		22		17	60			51	84								
4	4		13	48	46			4		42	1	28	48		107		5	43	225			2					
5			105	72	113		72	62		261																	
6				19																							
7			7	30	32		55	19	23	89		37		17	53				70								
8			118	157	129		12	1		3																	
9			20	41	36		19	6	21	109		26		17	55			23	52								
10		22	11	62	34			15	20	107	35	38	7	20	41		21	57	67		50			21	46	50	67
11	1		22	19	67		63	14	15	40		21		30	58				143								
12			28	45	77		61	17	37	170		43		21	210												
13			23	30	41			36	17	39		24		51	125		10	105	217								
14																			7								
15			10	30	62			29	27	130	83	31		20	54		64	62	165								
16		126	14	81	83		13		18	261	165	16	102	23				47	191							26	
17					34				23	28	19	35		18	47			49	91								
18			37	74	105		74	31		283		199															
19	1		60	32	52		10																				
20	1		20	27	34			11	14	154	16	24		17	76			42	69								
21			42	24	48		64	71	39	123		21		24	38			7	199								
22				183	229		57											5									
23			31	41	85		64	38		250																	
24																			29								
25																			15								
26			38	108	79		68	20	29	193		51		20	96				62								
27			121	52	101		135	46	32	109		42		35					1								
28			90	145	190		159	30	42	317		82		42	66												

Table 2.2.5c

Minutes in Each Lesson by Students in One Class
College I: Biology 111
Fall 1975

Student	Lesson 1A	1B	1G	2A	2C	5A	6A	6B	6E	6F	6G	6H	6I	13D	13E
1	2				15	136		32	25	32				65	28
2	3			29	18	66				10					16
3	26				34	171								144	9
4	1					106			41	54	9			108	64
5	7														
6	6				76	108			39	39	28			25	
7	1				36	102			28	33				81	76
8	6				38	59			13	19	6	32	17	153	
9						117			23	21				104	74
10	28					100			39	11					
11			30		27	73			15	29	5	2	15	5	
12	5				37	83			8	12	15			36	
13	83				2	103									
14	19					222			5	16	1			113	
15	5				11										
16		15													
17				20	5	95		2	37	27	5			36	33
18	5				2	75								94	58
19			5			108			28	16				25	
20					67	101		22	35	25				163	103
21					38	100			3	35			22		
22					35	107			19	12	9			25	
23					29										
24					14	68			27	9					
25					1	227			42	26				57	76
26	109				17	70		2	35					52	
27						144			44	17	16				
28					3	88	18		28	51	12			33	57
29					10	27							89		
30						43									
31					30	147			48						
32					4	77			33	33				122	94
33						86			25	16	1			130	117
34						114			42	15				170	13
35						50			23	22					
36					9	149		6	13	12		14	6	40	

Table 2.2.5d

Minutes in Each Lesson by Students in One Class
College III. Biology 102
Fall 1975

	Lesson																			
Student	1A	1C	4A	4C	4D	5A	5B	7A	7B	7C	7D	7E	7F	8A	8B	8C	9A	9B	9C	13C
1	24		65	44	61	38	29	3	5	14								40		58
2	9		39		37	36	37													56
3	183		155	89	149	30	55	118	48	109	18	13	7	30	35	41	29	39	26	30
4	16		68	45	75															84
5	13		43	32	73	139	15	73	2	3				43	18		14	21	29	76
6	13		78	39	63		56	85												37
7	8		85	36	66	40	42	91	2					49			14	71	41	94
8			16	23	26	27	20	25						18			18	13	23	40
9			22	23	9															44
10	7	25	28	27	43	22	28	36	36	20		3	4	22	20		9	18	12	79
11	6		120	69	49		57	2												79
12	8		21	15	61	26	29	12	4					19			13	25	15	44
13	1		38	28	29			5												42
14						89	50											28	18	35
15	8		32	37	36	21	11							21	12		19	30	21	38
16			23	32		25	35													40
17			17	16	17	27	15													53
18	11		44	21	79	26	32	3												27
19			32	32	48	65	27	55	49					64	29	1	43	43	31	80
20		21	61	79	107	32	20	47	4	24		11	5	25			15	16	11	54
21	13		23	26	49	1	20	6												44
22																				67
23			29		41	70	47													64
24			35	25	117	18	67											37	11	22
25			51	29	41			50	23											
26			53	25	53	20	57													
27	8		69	51	135	43	26	97	64	13		8	6	55	34	33	16	29	21	
28			29	10	34	109	31			5		27		90	73	30	45	42	33	

Table 2.2.5e

Minutes in Each Lesson by Students in One Class
College I: Biology 112
Fall 1975

Student	Lesson 1A	4B	4C	5A	7E	7F	7H	8A	8B	9G	9H	9I	13C
1	2	37		66	17								56
2	7	24	65	60	41								210
3		32			33		10						170
4		16		42	6								87
5	10	48	96	79	5		121	5	18	21			266
6		39		41	19		21						11
7		11		94	6		37						159
8		39	41	14	99	28	79	1	18				264
9		442		74									
10		32											
11		11		61	2								
12		10		25		2			8				92
13		102	35	62	60		49						212
14	1	12		39	38								157
15	3	41		71	68		38						297
16	2	37		26	10								78
17		32	3		25	2	12						156
18		48	54	71	41		71			6			96
19		53		60	26		76						101
20		22	65	93	4	40	48		26				140
21		33	33	84	27		29	1	22				120
22	39	133	63	112						82	64	2	460
23		47	16					2	12				129
24		40	84	54	48								172
25	22	9		63	58		8						175
26		27											
27		97		56	34	6							199
28		11		25	1	21	6						21
29		41	72	66	24		85	1	15				254
30		17			43								142
31		1		61					9				
32		80											
33		90	39										39
34	20	7	1	57	48		2						245
35	10			30	25	2	4						102

Table 2.2.5f

Minutes in Each Lesson by Students in One Class
College IV: Chemistry 101
Fall 1975

Student	Lesson 01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21
1	49	50	15	54	70	21		38	33	39				28							
2	7	48	23	36	2		32	57	19	16	23			18	40						
3	67	96						55	140	26	31				98						
4	36	108	26	71	47	30	83	41	64	18	18			18		31					
5	66	154		171	107	55	124	82	177	45	64	42	2	58	194						
6	153			126	33	24		128	254												
7	43	131		56		26	47	58	32	40				48	111						
8	48	73	1	70	87	16	88		18	24	25	45	3	29	7	9					
9	38	88		39	44	35	56	42	39	40	18			30	58			1	13		
10	3	63	49	9	16	16	16	36	73		19			20	48		9				
11	81	129	18	68	129	16	86	103	38	21	25	71		23	98						
12	63	83	46	62	55	20	119	34	31	19	12	38	5	16	39	30	19				11
13	56	120	42	95	32	22	114	51	131	18	16	63	19	61	90	38	28	1	7		
14	48	56	38	133	63	18	93	51	53	56	24	37	10	41	54	7		1	8	5	
15		115	34	86	49	24	107	35	78	10		24	11		106						
16	55	99	41	115	20	14	74	33	51	15	38	46	9	28	89	109	7	1		10	17
17		75					102	39	38	9	18	37		49	65			1	2		
18	13			112		19		36	36	28			5		117						
19		112		107		82		65	40	7					27						
20	87					5			39												
21	9							92	89						146						

Table 2.2.5g

Minutes in Each Lesson by Students in One Class
College I: Mathematics 111
Fall 1975

Lesson

Student	01	02	03	04	05	06	07	08	09	10	11	12	13	17	18	19	20	21	22	23	24	25	26	27	28	29
1	1	16	3	45	23	25	72	16	2	5	21	6														
2	1	21	7	16	23	15	48		3	2	4	2	9			22	2									
3	1		7	130	15	14	48																			
4			17		43		37											19	6	58						
5			15	81	10	50	42	22	2	2	1	2		3		3			34	27	10	11	60	1	2	1
6	2		4	97															39	16						
7			2	113	3	29	54	15	4	5	1	2	24						8	35		7	6			
8	3	83	4															35	15							
9			3	38														20	28	4						
10				53	24		24	46											9	13						
11			4	89	5	23	24	27	1					3		4	1		6	34			1			
12	1		3	59	9	35	46	23	2					3		4		6	36	36		11		3		1
13	4			63	7	30	41	16										3	15	78	3	4				
14			5	107			64	18	2	4	7	4	27	6		4	1									
15	2		3	41	5	19	25	24	1					4		2	1	10	4	16			7			
16	1	47	4	62	14	48	28	32	2					6		4		19	49	42			5			
17	1		4	77	17	33	31		1					5		4	2		8	43						
18			11	51	5	7	22	31											44							
19			2	58	15	25	27		2					3		7		20	29	31		9	4	1	1	
20				125	14	36													6							
21				49	5	44	25		1					4				35	2	34		4				
22	1		5	29	2	14	55	15	[illegible]					4	1	3		11	14	25		24	8	1	1	1
23			2	21																						
24			9	101	17	32	27	29																		
25			3	146	22	32	68	16	1									6	20	21						
26					19																					
27			3	68			52		2	2	2	3	9						40	28						
28			8	44	12	26													30	20		3				
29			21	70	4	43	40	32										19	15	49						
30			32	13			57												11							
31				48	22	13																				

Student	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61
1																																
2																																
3																																
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5	8																															
6																																
7																																
8																																
9																																
10																																
11		3	2	4	3	5	1	1		1	1	22	9																			
12														1	1																	
13																																
14		3																														
15	7	3	1	3	2	4	1		1	1	1	16	3			22	13	5	12													
16		3																														
17		9																		9												
18																																
19		6	1	1											1						1											
20																																
21																																
22	18	5	1	4								23		1	1	1	9					6	2	2	1	4	1	4	4	2	2	2
23																																
24																																
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Table 5.2.1a

Accounting
Fall 1975
College I

ACCOUNTING PRETEST (131)
FINAL EXAMINATION IN ACCOUNTING 101 - (191)

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	10	230.0000	5440.0000	23.0000	15.0000	3.8730	4.0825	17.0000	32.0000
PRE &POS	13	308.0000	7642.0000	23.6923	26.5207	5.1498	5.3601	13.0000	32.0000
POS &PRE	13	354.0000	10562.0000	27.2308	70.9467	8.4230	8.7669	11.0000	42.0000
POS ONLY	3	63.0000	1709.0000	21.0000	128.6667	11.3431	13.8924	12.0000	37.0000

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	5	118.0000	2840.0000	23.6000	11.0400	3.3226	3.7148	19.0000	29.0000
PRE &POS	25	578.0000	14030.0000	23.1200	26.6656	5.1639	5.2704	14.0000	33.0000
POS &PRE	25	596.0000	15630.0000	23.8400	56.8544	7.5402	7.6957	9.0000	35.0000
POS ONLY	3	51.0000	939.0000	17.0000	24.0000	4.8990	6.0000	11.0000	23.0000

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	15	348.0000	8280.0000	23.2000	13.7600	3.7094	3.8396	17.0000	32.0000
PRE &POS	38	886.0000	21672.0000	23.3158	26.6898	5.1662	5.2356	13.0000	33.0000
POS &PRE	38	950.0000	26192.0000	25.0000	64.2632	8.0164	8.1240	9.0000	42.0000
POS ONLY	6	114.0000	2648.0000	19.0000	80.3333	8.9629	9.8184	11.0000	37.0000

Table 5.2.1a (cont.)

ACCOUNTING PRETEST (131)
TEST OF ACCOUNTING - (193)

College II

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	8	217.0000	5979.0000	27.1250	11.6094	3.4073	3.6425	22.0000	33.0000
PRE &POS	15	422.0000	12254.0000	28.1333	25.4489	5.0447	5.2217	21.0000	36.0000
POS &PRE	15	383.0000	10505.0000	25.5333	48.3822	6.9557	7.1999	14.0000	40.0000
POS ONLY	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	5	120.0000	3026.0000	24.0000	29.2000	5.4037	6.0415	15.0000	32.0000
PRE &POS	12	348.0000	10310.0000	29.0000	18.1667	4.2622	4.4518	17.0000	34.0000
POS &PRE	12	327.0000	10127.0000	27.2500	101.3542	10.0675	10.5151	12.0000	43.0000
POS ONLY	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	13	337.0000	9005.0000	25.9231	20.6864	4.5482	4.7339	15.0000	33.0000
PRE &POS	27	770.0000	22564.0000	28.5185	22.3978	4.7326	4.8228	17.0000	36.0000
POS &PRE	27	710.0000	20632.0000	26.2963	72.6529	8.5237	8.6860	12.0000	43.0000
POS ONLY	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 5.2.1a (cont.)

College III

ACCOUNTING PRETEST (131)
INTRODUCTORY ACCOUNTING - (192)

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	53	1410.0000	39008.0000	26.6038	28.2392	5.3141	5.3649	16.0000	38.0000
PRE &POS	88	2549.0000	75335.0000	28.9659	17.0557	4.1298	4.1535	18.0000	35.0000
POS &PRE	88	2935.0000	104537.0000	33.3523	75.5464	8.6917	8.7416	8.0000	49.0000
POS ONLY	3	77.0000	1989.0000	25.6667	4.2222	2.0548	2.5166	23.0000	28.0000

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	29	866.0000	26306.0000	29.8621	15.3603	3.9192	3.9886	20.0000	37.0000
PRE &POS	60	1954.0000	64676.0000	32.5667	17.3456	4.1648	4.1999	20.0000	39.0000
POS &PRE	60	2156.0000	82892.0000	35.9333	90.3289	9.5042	9.5844	14.0000	50.0000
POS ONLY	1	42.0000	1764.0000	42.0000	0.0	0.0	0.0	42.0000	42.0000

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	82	2276.0000	65314.0000	27.7561	26.1112	5.1099	5.1414	16.0000	38.0000
PRE &POS	148	4503.0000	140011.0000	30.4257	20.2985	4.5054	4.5207	18.0000	39.0000
POS &PRE	148	5091.0000	187429.0000	34.3986	83.1451	9.1184	9.1494	8.0000	50.0000
POS ONLY	4	119.0000	3753.0000	29.7500	53.1875	7.2930	8.4212	23.0000	42.0000

Table 5.2.1b
Biology
Fall 1975
College II

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BIOLOGY PRETEST I (231)
BIOLOGY 101 TEST - (291)

                          ALL PLATO CLASSES

                  N       SUM        SUM**2        MEAN        VAR(N)      SD(N)     SD(N-1)     LOW        HIGH

PRE ONLY         17     277.0000    5365.0000    16.2941      50.0900     7.0774     7.2952     5.0000    31.0000
PRE &POS         29     558.0000   12028.0000    19.2414      44.5279     6.6729     6.7910     7.0000    35.0000
POS &PRE         29     652.0000   16808.0000    22.4828      74.1118     8.6088     8.7612    10.0000    45.0000
POS ONLY          4     108.0000    3206.0000    27.0000      72.5000     8.5147     9.8319    18.0000    39.0000


                          ALL NON PLATO CLASSES

                  N       SUM        SUM**2        MEAN        VAR(N)      SD(N)     SD(N-1)     LOW        HIGH

PRE ONLY         15     249.0000    4491.0000    16.6000      23.8400     4.8826     5.0540     9.0000    29.0000
PRE &POS         30     623.0000   14249.0000    20.7667      43.7122     6.6115     6.7245     8.0000    36.0000
POS &PRE         30     740.0000   20430.0000    24.6667      72.5556     8.5180     8.6636    11.0000    46.0000
POS ONLY          6     156.0000    4378.0000    26.0000      53.6667     7.3258     8.0250    17.0000    35.0000


                          ALL CLASSES

                  N       SUM        SUM**2        MEAN        VAR(N)      SD(N)     SD(N-1)     LOW        HIGH

PRE ONLY         32     526.0000    9856.0000    16.4375      37.8086     6.1489     6.2473     5.0000    31.0000
PRE &POS         59    1181.0000   26277.0000    20.0169      44.6946     6.6854     6.7428     7.0000    36.0000
POS &PRE         59    1392.0000   37238.0000    23.5932      74.5125     8.6321     8.7062    10.0000    46.0000
POS ONLY         10     264.0000    7584.0000    26.4000      61.4400     7.8384     8.2624    17.0000    39.0000
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Table 5.2.1b (cont.)

BIOLOGY PRETEST I (231)
BIOLOGY 111 TEST - (292)

College I

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	79	1642.0000	38006.0000	20.7848	49.0803	7.0057	7.0505	7.0000	37.0000
PRE &POS	145	3069.0000	70803.0000	21.1655	40.3174	6.3496	6.3716	8.0000	37.0000
POS &PRE	145	2749.0000	60489.0000	18.9586	57.7362	7.5984	7.6248	7.0000	42.0000
POS ONLY	10	196.0000	4268.0000	19.6000	42.6400	6.5299	6.8832	7.0000	29.0000

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	39	763.0000	17011.0000	19.5641	53.4254	7.3093	7.4048	8.0000	37.0000
PRE &POS	62	1178.0000	25312.0000	19.0000	47.2581	6.8745	6.9306	7.0000	38.0000
POS &PRE	62	1252.0000	27810.0000	20.1935	40.7690	6.3851	6.4372	9.0000	35.0000
POS ONLY	10	211.0000	4855.0000	21.1000	40.2900	6.3474	6.6908	12.0000	32.0000

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	118	2405.0000	55017.0000	20.3814	50.8461	7.1306	7.1611	7.0000	37.0000
PRE &POS	207	4247.0000	96115.0000	20.5169	43.3801	6.5864	6.6023	7.0000	38.0000
POS &PRE	207	4001.0000	88299.0000	19.3285	52.9742	7.2783	7.2960	7.0000	42.0000
POS ONLY	20	407.0000	9123.0000	20.3500	42.0275	6.4829	6.6513	7.0000	32.0000

Table 5.2.1b (cont.)

BIOLOGY PRETEST II (232)
BIOLOGY 102 TEST - (294) (294)

College III

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	46	644.0000	9988.0000	14.0000	21.1304	4.5968	4.6476	4.0000	28.0000
PRE &POS	79	1194.0000	19550.0000	15.1139	19.0377	4.3637	4.3911	5.0000	25.0000
POS &PRE	79	1738.0000	42152.0000	22.0000	49.5696	7.0406	7.0856	8.0000	38.0000
POS ONLY	4	78.0000	1874.0000	19.5000	88.2500	9.3941	10.8474	10.0000	35.0000

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	29	424.0000	6620.0000	14.6207	14.5113	3.8094	3.8768	8.0000	22.0000
PRE &POS	56	920.0000	16604.0000	16.4286	26.6020	5.1577	5.2044	8.0000	35.0000
POS &PRE	56	1329.0000	35799.0000	23.7321	76.0533	8.7209	8.7998	6.0000	42.0000
POS ONLY	2	43.0000	1069.0000	21.5000	72.2500	8.5000	12.0208	13.0000	30.0000

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	75	1068.0000	16608.0000	14.2400	18.6624	4.3200	4.3491	4.0000	28.0000
PRE &POS	135	2114.0000	36154.0000	15.6593	22.5950	4.7534	4.7711	5.0000	35.0000
POS &PRE	135	3067.0000	77951.0000	22.7185	61.2837	7.8284	7.8575	6.0000	42.0000
POS ONLY	6	121.0000	2943.0000	20.1667	83.8056	9.1545	10.0283	10.0000	35.0000

Table 5.2.1b (cont.)

BIOLOGY PRETEST II (232)
BIOLOGY 112 TEST - (293)

College I

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	19	207.0000	2551.0000	10.8947	15.5679	3.9456	4.0537	3.0000	20.0000
PRE &POS	61	742.0000	10008.0000	12.1639	16.1043	4.0130	4.0463	4.0000	26.0000
POS &PRE	61	991.0000	17461.0000	16.2459	22.3166	4.7240	4.7632	7.0000	26.0000
POS ONLY	8	122.0000	1962.0000	15.2500	12.6875	3.5620	3.8079	10.0000	20.0000

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	49	569.0000	7671.0000	11.6122	21.7068	4.6591	4.7073	5.0000	25.0000
PRE &POS	29	405.0000	6489.0000	13.9655	28.7229	5.3594	5.4542	7.0000	31.0000
POS &PRE	29	473.0000	9003.0000	16.3103	44.4209	6.6649	6.7829	6.0000	34.0000
POS ONLY	8	124.0000	2054.0000	15.5000	16.5000	4.0620	4.3425	10.0000	20.0000

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	68	776.0000	10222.0000	11.4118	20.0952	4.4828	4.5161	3.0000	25.0000
PRE &POS	90	1147.0000	16497.0000	12.7444	20.8791	4.5694	4.5950	4.0000	31.0000
POS &PRE	90	1464.0000	26464.0000	16.2667	29.4400	5.4259	5.4563	6.0000	34.0000
POS ONLY	16	246.0000	4016.0000	15.3750	14.6094	3.8222	3.9476	10.0000	20.0000

Table 5.2.1c

Chemistry
Fall 1975

College 1

CHEMISTRY PRETEST (331)
ATOMIC STRUCTURE AND BONDING - (371,372,373)

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	6	67.0000	835.0000	11.1667	14.4722	3.8042	4.1673	6.0000	17.0000
PR2 ONLY	6	33.0000	239.0000	5.5000	9.5833	3.0957	3.3912	2.0000	11.0000
PR1 &POS	27	327.0000	4151.0000	12.1111	7.0617	2.6574	2.7080	8.0000	19.0000
PR2 &POS	27	136.0000	794.0000	5.0370	4.0357	2.0089	2.0472	1.0000	9.0000
POS &PRE	27	310.0000	3850.0000	11.4815	10.7682	3.2815	3.3440	5.0000	17.0000
POS ONLY	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	5	52.0000	550.0000	10.4000	1.8400	1.3565	1.5166	8.0000	12.0000
PR2 ONLY	5	25.0000	133.0000	5.0000	1.6000	1.2649	1.4142	3.0000	7.0000
PR1 &POS	26	308.0000	4026.0000	11.8462	14.5148	3.8098	3.8853	4.0000	21.0000
PR2 &POS	26	156.0000	1196.0000	6.0000	10.0000	3.1623	3.2249	0.0	12.0000
POS &PRE	26	318.0000	4152.0000	12.2308	10.1006	3.1781	3.2411	6.0000	18.0000
POS ONLY	1	19.0000	361.0000	19.0000	0.0	0.0	0.0	19.0000	19.0000

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	11	119.0000	1385.0000	10.8182	8.8760	2.9793	3.1247	6.0000	17.0000
PR2 ONLY	11	58.0000	372.0000	5.2727	6.0165	2.4529	2.5726	2.0000	11.0000
PR1 &POS	53	635.0000	8177.0000	11.9811	10.7355	3.2765	3.3077	4.0000	21.0000
PR2 &POS	53	292.0000	1990.0000	5.5094	7.1933	2.6820	2.7077	0.0	12.0000
POS &PRE	53	628.0000	8002.0000	11.8491	10.5810	3.2528	3.2840	5.0000	18.0000
POS ONLY	1	19.0000	361.0000	19.0000	0.0	0.0	0.0	19.0000	19.0000

Table 5.21c (cont.)

CHEMISTRY 331 PRETEST
NOMENCLATURE - (374,375,376)

College I

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	13	156.0000	1986.0000	12.0000	8.7692	2.9613	3.0822	6.0000	17.0000
PR2 ONLY	13	79.0000	569.0000	6.0769	6.8402	2.6154	2.7222	2.0000	11.0000
PR1 &POS	20	238.0000	3000.0000	11.9000	8.3900	2.8965	2.9718	7.0000	19.0000
PR2 &POS	20	90.0000	464.0000	4.5000	2.9500	1.7176	1.7622	1.0000	8.0000
POS &PRE	20	197.0000	2307.0000	9.8500	18.3275	4.2811	4.3923	2.0000	19.0000
POS ONLY	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	9	114.0000	1564.0000	12.6667	13.3333	3.6515	3.8730	8.0000	21.0000
PR2 ONLY	9	62.0000	514.0000	6.8889	9.6543	3.1071	3.2956	3.0000	12.0000
PR1 &POS	22	246.0000	3012.0000	11.1818	11.6760	3.4462	3.5273	4.0000	17.0000
PR2 &POS	22	119.0000	815.0000	5.4091	7.7872	2.7906	2.8562	0.0	10.0000
POS &PRE	22	245.0000	3259.0000	11.1364	24.1178	4.9110	5.0266	4.0000	23.0000
POS ONLY	1	20.0000	400.0000	20.0000	0.0	0.0	0.0	20.0000	20.0000

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	22	270.0000	3550.0000	12.2727	10.7438	3.2778	3.3549	6.0000	21.0000
PR2 ONLY	22	141.0000	1083.0000	6.4091	8.1508	2.8550	2.9222	2.0000	12.0000
PR1 &POS	42	484.0000	6012.0000	11.5238	10.3447	3.2163	3.2553	4.0000	19.0000
PR2 &POS	42	209.0000	1279.0000	4.9762	5.6899	2.3854	2.4143	0.0	10.0000
POS &PRE	42	442.0000	5566.0000	10.5238	21.7732	4.6662	4.7227	2.0000	23.0000
POS ONLY	1	20.0000	400.0000	20.0000	0.0	0.0	0.0	20.0000	20.0000

Table 5.2.1c (cont.)

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CHEMISTRY 331 PRETEST
FORMULAS, EQUATIONS, STOICHIOMETRY - (377,378,379)                College I

                        ALL PLATO CLASSES

                   N        SUM          SUM**2        MEAN        VAR(N)      SD(N)      SD(N-1)      LOW        HIGH

PR1 ONLY          17      196.0000     2420.0000     11.5294       9.4256     3.0701      3.1646     6.0000     17.0000
PR2 ONLY          17       87.0000      569.0000      5.1176       7.2803     2.6982      2.7812     1.0000     11.0000
PR1 &POS          16      198.0000     2566.0000     12.3750       7.2344     2.6897      2.7779     8.0000     19.0000
PR2 &POS          16       82.0000      464.0000      5.1250       2.7344     1.6536      1.7078     2.0000      8.0000
POS &PRE          16      103.0000      819.0000      6.4375       9.7461     3.1219      3.2243     2.0000     12.0000
POS ONLY           0        0.0           0.0         0.0          0.0        0.0         0.0        0.0         0.0


                        ALL NON PLATO CLASSES

                   N        SUM          SUM**2        MEAN        VAR(N)      SD(N)      SD(N-1)      LOW        HIGH

PR1 ONLY          10      107.0000     1325.0000     10.7000      18.0100     4.2438      4.4734     4.0000     21.0000
PR2 ONLY          10       51.0000      387.0000      5.1000      12.6900     3.5623      3.7550     0.0        12.0000
PR1 &POS          21      253.0000     3251.0000     12.0476       9.6644     3.1088      3.1855     6.0000     17.0000
PR2 &POS          21      130.0000      942.0000      6.1905       6.5351     2.5564      2.6195     2.0000     11.0000
POS &PRE          21      143.0000     1107.0000      6.8095       6.3447     2.5189      2.5811     2.0000     11.0000
POS ONLY           1        8.0000       64.0000      8.0000       0.0        0.0         0.0        8.0000      8.0000


                        ALL CLASSES

                   N        SUM          SUM**2        MEAN        VAR(N)      SD(N)      SD(N-1)      LOW        HIGH

PR1 ONLY          27      303.0000     3745.0000     11.2222      12.7654     3.5729      3.6409     4.0000     21.0000
PR2 ONLY          27      138.0000      956.0000      5.1111       9.2840     3.0470      3.1050     0.0        12.0000
PR1 &POS          37      451.0000     5817.0000     12.1892       8.6399     2.9394      2.9799     6.0000     19.0000
PR2 &POS          37      212.0000     1406.0000      5.7297       5.1702     2.2738      2.3052     2.0000     11.0000
POS &PRE          37      246.0000     1926.0000      6.6486       7.8495     2.8017      2.8403     2.0000     12.0000
POS ONLY           1        8.0000       64.0000      8.0000       0.0        0.0         0.0        8.0000      8.0000
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Table 5.2.1c (cont.)

CHEMISTRY 331 PRETEST
GASES PRETEST- (380,381,382)

College I

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	15	170.0000	2074.0000	11.3333	9.8222	3.1340	3.2440	6.0000	17.0000
PR2 ONLY	15	81.0000	537.0000	5.4000	6.6400	2.5768	2.6673	2.0000	11.0000
PR1 &POS	18	224.0000	2912.0000	12.4444	6.9136	2.6294	2.7056	8.0000	19.0000
PR2 &POS	18	88.0000	496.0000	4.8889	3.6543	1.9116	1.9670	1.0000	8.0000
POS &PRE	18	82.0000	428.0000	4.5556	3.0247	1.7392	1.7896	1.0000	8.0000
POS ONLY	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	11	125.0000	1503.0000	11.3636	7.5041	2.7394	2.8731	7.0000	17.0000
PR2 ONLY	11	64.0000	460.0000	5.8182	7.9669	2.8226	2.9603	1.0000	10.0000
PR1 &POS	20	235.0000	3073.0000	11.7500	15.5875	3.9481	4.0507	4.0000	21.0000
PR2 &POS	20	117.0000	869.0000	5.8500	9.2275	3.0377	3.1166	0.0	12.0000
POS &PRE	20	76.0000	346.0000	3.8000	2.8600	1.6912	1.7351	0.0	7.0000
POS ONLY	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	26	295.0000	3577.0000	11.3462	8.8417	2.9735	3.0324	6.0000	17.0000
PR2 ONLY	26	145.0000	997.0000	5.5769	7.2441	2.6915	2.7448	1.0000	11.0000
PR1 &POS	38	459.0000	5985.0000	12.0789	11.5990	3.4057	3.4515	4.0000	21.0000
PR2 &POS	38	205.0000	1365.0000	5.3947	6.8179	2.6111	2.6462	0.0	12.0000
POS &PRE	38	158.0000	774.0000	4.1579	3.0803	1.7551	1.7786	0.0	8.0000
POS ONLY	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 5.2.1c (cont.)

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CHEMISTRY 331 PRETEST
GASES POSTTEST  - (383,384,385)                                  College I

                          ALL PLATO CLASSES

                     N         SUM           SUM**2         MEAN          VAR(N)        SD(N)       SD(N-1)        LOW          HIGH

PR1 ONLY            16       184.0000      2252.0000      11.5000         8.5000       2.9155       3.0111       6.0000       17.0000
PR2 ONLY            16        86.0000       568.0000       5.3750         6.6094       2.5709       2.6552       2.0000       11.0000
PR1 &POS            17       210.0000      2734.0000      12.3529         8.2284       2.8685       2.9563       8.0000       19.0000
PR2 &POS            17        83.0000       465.0000       4.8824         3.5156       1.8750       1.9327       1.0000        8.0000
POS &PRE            17       123.0000      1007.0000       7.2353         6.8858       2.6241       2.7048       2.0000       12.0000
POS ONLY             0         0.0            0.0          0.0            0.0          0.0          0.0          0.0           0.0



                          ALL NON PLATO CLASSES

                     N         SUM           SUM**2         MEAN          VAR(N)        SD(N)       SD(N-1)        LOW          HIGH

PR1 ONLY            11       104.0000      1054.0000       9.4545         6.4298       2.5357       2.6595       4.0000       13.0000
PR2 ONLY            11        51.0000       315.0000       4.6364         7.1405       2.6722       2.8026       0.0          10.0000
PR1 &POS            20       256.0000      3522.0000      12.8000        12.2500       3.5014       3.5924       6.0000       21.0000
PR2 &POS            20       130.0000      1014.0000       6.5000         8.4500       2.9069       2.9824       2.0000       12.0000
POS &PRE            20       154.0000      1376.0000       7.7000         9.5100       3.0838       3.1639       4.0000       15.0000
POS ONLY             1        11.0000       121.0000      11.0000         0.0          0.0          0.0         11.0000       11.0000



                          ALL CLASSES

                     N         SUM           SUM**2         MEAN          VAR(N)        SD(N)       SD(N-1)        LOW          HIGH

PR1 ONLY            27       288.0000      3306.0000      10.6667         8.6667       2.9439       3.0000       4.0000       17.0000
PR2 ONLY            27       137.0000       883.0000       5.0741         6.9575       2.6377       2.6879       0.0          11.0000
PR1 &POS            37       466.0000      6256.0000      12.5946        10.4573       3.2338       3.2784       6.0000       21.0000
PR2 &POS            37       213.0000      1479.0000       5.7568         6.8327       2.6139       2.6500       1.0000       12.0000
POS &PRE            37       277.0000      2383.0000       7.4865         8.3579       2.8910       2.9309       2.0000       15.0000
POS ONLY             1        11.0000       121.0000      11.0000         0.0          0.0          0.0         11.0000       11.0000
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Table 5.2.1c (cont.)

CHEMISTRY PRETEST (331)
SOLUTIONS (121) - (360)

College II

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	11	145.0000	2103.0000	13.1818	17.4215	4.1739	4.3776	5.0000	18.0000
PR2 ONLY	11	55.0000	311.0000	5.0000	3.2727	1.8091	1.8974	2.0000	9.0000
PR1 &POS	15	162.0000	2116.0000	10.8000	24.4267	4.9423	5.1156	0.0	20.0000
PR2 &POS	15	81.0000	555.0000	5.4000	7.8400	2.8000	2.8983	2.0000	12.0000
POS &PRE	15	191.0000	2927.0000	12.7333	32.9956	5.7442	5.9456	4.0000	22.0000
POS ONLY	5	50.0000	652.0000	10.0000	30.4000	5.5136	6.1644	3.0000	17.0000

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	10	130.0000	1790.0000	13.0000	10.0000	3.1623	3.3333	7.0000	18.0000
PR2 ONLY	10	56.0000	402.0000	5.6000	8.8400	2.9732	3.1340	0.0	10.0000
PR1 &POS	9	133.0000	2003.0000	14.7778	4.1728	2.0428	2.1667	10.0000	17.0000
PR2 &POS	9	50.0000	318.0000	5.5556	4.4691	2.1140	2.2423	2.0000	9.0000
POS &PRE	9	155.0000	2879.0000	17.2222	23.2840	4.8253	5.1181	7.0000	23.0000
POS ONLY	3	41.0000	649.0000	13.6667	29.5556	5.4365	6.6583	8.0000	21.0000

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	21	275.0000	3893.0000	13.0952	13.8957	3.7277	3.8197	5.0000	18.0000
PR2 ONLY	21	111.0000	713.0000	5.2857	6.0136	2.4523	2.5128	0.0	10.0000
PR1 &POS	24	295.0000	4119.0000	12.2917	20.5399	4.5321	4.6296	0.0	20.0000
PR2 &POS	24	131.0000	873.0000	5.4583	6.5816	2.5655	2.6206	2.0000	12.0000
POS &PRE	24	346.0000	5806.0000	14.4167	34.0764	5.8375	5.9631	4.0000	23.0000
POS ONLY	8	91.0000	1301.0000	11.3750	33.2344	5.7649	6.1630	3.0000	21.0000

Table 5.2.1c (cont.)

CHEMISTRY 331 PRETEST
ATOMIC STRUCTURE AND BONDING (121) - (362)

College II

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	26	352.0000	5178.0000	13.5385	15.8639	3.9830	4.0618	5.0000	23.0000
PR2 ONLY	26	134.0000	902.0000	5.1538	8.1302	2.8513	2.9078	0.0	14.0000
PR1 &POS	52	651.0000	9287.0000	12.5192	21.8650	4.6760	4.7216	0.0	27.0000
PR2 &POS	52	274.0000	1874.0000	5.2692	8.2737	2.8764	2.9045	0.0	12.0000
POS &PRE	52	623.0000	8249.0000	11.9808	15.0958	3.8853	3.9232	6.0000	21.0000
POS ONLY	25	283.0000	3553.0000	11.3200	13.9776	3.7387	3.8158	4.0000	17.0000

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	20	169.0000	2039.0000	8.4500	30.5475	5.5270	5.6706	0.0	16.0000
PR2 ONLY	20	102.0000	796.0000	5.1000	13.7900	3.7135	3.8100	0.0	14.0000
PR1 &POS	37	440.0000	5988.0000	11.8919	20.4207	4.5189	4.5813	3.0000	23.0000
PR2 &POS	37	207.0000	1547.0000	5.5946	10.5113	3.2421	3.2858	0.0	15.0000
POS &PRE	37	454.0000	6396.0000	12.2703	22.3053	4.7229	4.7880	4.0000	22.0000
POS ONLY	20	224.0000	2878.0000	11.2000	18.4600	4.2965	4.4081	5.0000	21.0000

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	46	521.0000	7217.0000	11.3261	28.6111	5.3489	5.4080	0.0	23.0000
PR2 ONLY	46	236.0000	1698.0000	5.1304	10.5917	3.2545	3.2904	0.0	14.0000
PR1 &POS	89	1091.0000	15275.0000	12.2584	21.3602	4.6217	4.6479	0.0	27.0000
PR2 &POS	89	481.0000	3421.0000	5.4045	9.2296	3.0380	3.0552	0.0	15.0000
POS &PRE	89	1077.0000	14645.0000	12.1011	18.1134	4.2560	4.2801	4.0000	22.0000
POS ONLY	45	507.0000	6431.0000	11.2667	15.9733	3.9967	4.0418	4.0000	21.0000

Table 5.2.1c (cont.)

CHEMISTRY 331 PRETEST
NOMENCLATURE - (363)

College II

ALL PLATU CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	26	353.0000	5199.0000	13.5769	15.6267	3.9533	4.0316	5.0000	23.0000
PR2 ONLY	26	139.0000	943.0000	5.3462	7.6879	2.7727	2.8276	0.0	14.0000
~~PR1~~ &POS	52	650.0000	9266.0000	12.5000	21.9423	4.6843	4.7300	0.0	27.0000
PR2 &POS	52	269.0000	1833.0000	5.1731	8.4893	2.9136	2.9421	0.0	12.0000
POS &PRE	52	649.0000	9743.0000	12.4808	31.5958	5.6210	5.6759	3.0000	25.0000
POS ONLY	25	303.0000	4135.0000	12.1200	18.5056	4.3018	4.3905	4.0000	22.0000

ALL NON PLATU CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	27	252.0000	3142.0000	9.3333	29.2593	5.4092	5.5122	0.0	18.0000
PR2 ONLY	27	145.0000	1081.0000	5.3704	11.1962	3.3461	3.4098	0.0	14.0000
PR1 &POS	30	357.0000	4865.0000	11.9000	21.2233	4.6069	4.6856	3.0000	23.0000
PR2 &POS	30	164.0000	1262.0000	5.4667	12.1822	3.4903	3.5500	0.0	15.0000
POS &PRE	30	455.0000	7833.0000	15.1667	31.0722	5.5742	5.6695	7.0000	24.0000
POS ONLY	15	165.0000	2337.0000	11.0000	34.8000	5.8992	6.1062	4.0000	21.0000

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	53	605.0000	8341.0000	11.4151	27.0730	5.2032	5.2530	0.0	23.0000
PR2 ONLY	53	284.0000	2024.0000	5.3585	9.4753	3.0782	3.1076	0.0	14.0000
PR1 &POS	82	1007.0000	14151.0000	12.2805	21.7628	4.6651	4.6938	0.0	27.0000
PR2 &POS	82	433.0000	3095.0000	5.2805	9.8604	3.1401	3.1594	0.0	15.0000
POS &PRE	82	1104.0000	17576.0000	13.4634	33.0779	5.7513	5.7867	3.0000	25.0000
POS ONLY	40	468.0000	6472.0000	11.7000	24.9100	4.9910	5.0546	4.0000	22.0000

Table 5.2.1c (cont.)

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CHEMISTRY 331 PRETEST
FORMULAS, EQUATIONS, STOICHIOMETRY (121) - (365)                College II

                          ALL PLATO CLASSES

                    N        SUM           SUM**2        MEAN        VAR(N)       SD(N)      SD(N-1)      LOW         HIGH

PR1 ONLY           31      405.0000      5781.0000     13.0645      15.8023      3.9752      4.0409      5.0000     23.0000
PR2 ONLY           31      164.0000      1120.0000      5.2903       6.1415      2.8533      2.9005      0.0        14.0000
PR1 &POS           47      598.0000      8684.0000     12.7234      22.8809      4.7834      4.8351      0.0        27.0000
PR2 &POS           47      244.0000      1656.0000      5.1915       8.2825      2.8779      2.9090      0.0        12.0000
POS &PRE           47      370.0000      3618.0000      7.8723      15.0050      3.8736      3.9155      1.0000     17.0000
POS ONLY           21      182.0000      1804.0000      8.6667      10.7937      3.2854      3.3665      3.0000     13.0000


                          ALL NON PLATO CLASSES

                    N        SUM           SUM**2        MEAN        VAR(N)       SD(N)      SD(N-1)      LOW         HIGH

PR1 ONLY           28      255.0000      3133.0000      9.1071      28.9528      5.3808      5.4795      0.0        18.0000
PR2 ONLY           28      149.0000      1097.0000      5.3214      10.8610      3.2956      3.3561      0.0        14.0000
PR1 &POS           29      354.0000      4894.0000     12.2069      19.7503      4.4441      4.5228      5.0000     23.0000
PR2 &POS           29      160.0000      1246.0000      5.5172      12.5256      3.5391      3.6018      0.0        15.0000
POS &PRE           29      278.0000      3102.0000      9.5862      15.0702      3.8820      3.9507      3.0000     20.0000
POS ONLY           15      116.0000      1290.0000      7.7333      26.1956      5.1182      5.2978      2.0000     19.0000


                          ALL CLASSES

                    N        SUM           SUM**2        MEAN        VAR(N)       SD(N)      SD(N-1)      LOW         HIGH

PR1 ONLY           59      660.0000      8914.0000     11.1864      25.9483      5.0939      5.1377      0.0        23.0000
PR2 ONLY           59      313.0000      2217.0000      5.3051       9.4323      3.0712      3.0976      0.0        14.0000
PR1 &POS           76      952.0000     13578.0000     12.5263      21.7493      4.6636      4.6946      0.0        27.0000
PR2 &POS           76      404.0000      2902.0000      5.3158       9.9266      3.1506      3.1716      0.0        15.0000
POS &PRE           76      648.0000      6720.0000      8.5263      15.7230      3.9652      3.9916      1.0000     20.0000
POS ONLY           36      298.0000      3094.0000      8.2778      17.4228      4.1741      4.2333      2.0000     19.0000
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Table 5.2.1c (cont.)

CHEMISTRY 331 PRETEST
MOLECULAR WEIGHTS(121) - (369)

College II

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	12	156.0000	2224.0000	13.0000	16.3333	4.0415	4.2212	5.0000	18.0000
PR2 ONLY	12	64.0000	392.0000	5.3333	4.2222	2.0548	2.1462	2.0000	9.0000
PR1 &POS	14	151.0000	1995.0000	10.7857	26.1684	5.1155	5.3086	0.0	20.0000
PR2 &POS	14	72.0000	474.0000	5.1429	7.4082	2.7218	2.8245	2.0000	12.0000
POS &PRE	14	156.0000	2022.0000	11.1429	20.2653	4.5017	4.6716	3.0000	17.0000
POS ONLY	6	64.0000	736.0000	10.6667	8.8889	2.9814	3.2660	7.0000	15.0000

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	9	121.0000	1709.0000	13.4444	9.1358	3.0225	3.2059	7.0000	18.0000
PR2 ONLY	9	49.0000	353.0000	5.4444	9.5802	3.0952	3.2830	0.0	10.0000
PR1 &POS	10	142.0000	2084.0000	14.2000	6.7600	2.6000	2.7406	9.0000	17.0000
PR2 &POS	10	57.0000	367.0000	5.7000	4.2100	2.0518	2.1628	2.0000	9.0000
POS &PRE	10	120.0000	1520.0000	12.0000	8.0000	2.8284	2.9814	8.0000	17.0000
POS ONLY	6	45.0000	393.0000	7.5000	9.2500	3.0414	3.3317	3.0000	13.0000

A-77

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	21	277.0000	3933.0000	13.1905	13.2971	3.6465	3.7366	5.0000	18.0000
PR2 ONLY	21	113.0000	745.0000	5.3810	6.5215	2.5537	2.6168	0.0	10.0000
PR1 &POS	24	293.0000	4079.0000	12.2083	20.9149	4.5733	4.6716	0.0	20.0000
PR2 &POS	24	129.0000	641.0000	5.3750	6.1510	2.4801	2.5335	2.0000	12.0000
POS &PRE	24	276.0000	3542.0000	11.5000	15.3333	3.9158	4.0000	3.0000	17.0000
POS ONLY	12	109.0000	1129.0000	9.0833	11.5764	3.4024	3.5537	3.0000	15.0000

Table 5.2.1c (cont.)

CHEMISTRY PRETEST (331)
ATOMIC STRUCTURE AND BONDING (201) - (361)

College II

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	10	126.0000	1720.0000	12.6000	13.2400	3.6387	3.8355	5.0000	18.0000
PR2 ONLY	10	57.0000	389.0000	5.7000	6.4100	2.5318	2.6687	3.0000	12.0000
PR1 &POS	48	750.0000	13028.0000	15.6250	27.2760	5.2226	5.2779	4.0000	32.0000
PR2 &POS	48	398.0000	3888.0000	8.2917	12.2483	3.4998	3.5368	0.0	15.0000
POS &PRE	48	685.0000	11207.0000	14.2708	29.8225	5.4610	5.5188	1.0000	25.0000
POS ONLY	16	194.0000	2712.0000	12.1250	22.4844	4.7418	4.8973	6.0000	21.0000

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	2	20.0000	218.0000	10.0000	9.0000	3.0000	4.2426	7.0000	13.0000
PR2 ONLY	2	17.0000	169.0000	8.5000	12.2500	3.5000	4.9497	5.0000	12.0000
PR1 &POS	7	156.0000	3626.0000	22.2857	21.3469	4.6203	4.9905	16.0000	30.0000
PR2 &POS	7	61.0000	583.0000	8.7143	7.3469	2.7105	2.9277	5.0000	13.0000
POS &PRE	7	101.0000	1559.0000	14.4286	14.5306	3.8119	4.1173	10.0000	22.0000
POS ONLY	13	172.0000	2532.0000	13.2308	19.7160	4.4403	4.6216	6.0000	21.0000

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	12	146.0000	1938.0000	12.1667	13.4722	3.6705	3.8337	5.0000	18.0000
PR2 ONLY	12	74.0000	558.0000	6.1667	8.4722	2.9107	3.0401	3.0000	12.0000
PR1 &POS	55	906.0000	16654.0000	16.4727	31.4493	5.6080	5.6597	4.0000	32.0000
PR2 &POS	55	459.0000	4471.0000	8.3455	11.6443	3.4124	3.4438	0.0	15.0000
POS &PRE	55	786.0000	12766.0000	14.2909	27.8790	5.2801	5.3287	1.0000	25.0000
POS ONLY	29	366.0000	5244.0000	12.6207	21.5458	4.6417	4.7239	6.0000	21.0000

Table 5.2.1c (cont.)

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CHEMISTRY 331 PRETEST
NOMENCLATURE -  (363)
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College II

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                              ALL PLATO CLASSES

                   N     SUM         SUM**2        MEAN         VAR(N)      SD(N)      SD(N-1)     LOW        HIGH

PR1 ONLY           9   111.0000     1489.0000     12.3333      13.3333     3.6515     3.8730     5.0000    18.0000
PR2 ONLY           9    55.0000      421.0000      6.1111       9.4321     3.0712     3.2575     3.0000    12.0000
PR1 &POS          49   765.0000    12259.0000     15.6122      26.8496     5.1817     5.2354     4.0000    32.0000
PR2 &POS          49   400.0000     3856.0000      8.1633      12.0550     3.4720     3.5080     0.0       15.0000
POS &PRE          49   734.0000    12450.0000     14.9796      29.6935     5.4492     5.5056     4.0000    25.0000
POS ONLY          18   266.0000     4494.0000     14.7778      31.2840     5.5932     5.7554     6.0000    24.0000


                              ALL NON PLATO CLASSES

                   N     SUM         SUM**2        MEAN         VAR(N)      SD(N)      SD(N-1)     LOW        HIGH

PR1 ONLY           2    20.0000      218.0000     10.0000       9.0000     3.0000     4.2426     7.0000    13.0000
PR2 ONLY           2    17.0000      169.0000      8.5000      12.2500     3.5000     4.9497     5.0000    12.0000
PR1 &POS           7   156.0000     3626.0000     22.2857      21.3469     4.6203     4.9905    16.0000    30.0000
PR2 &POS           7    61.0000      583.0000      8.7143       7.3469     2.7105     2.9277     5.0000    13.0000
POS &PRE           7   102.0000     1682.0000     14.5714      27.9592     5.2876     5.7113     6.0000    22.0000
POS ONLY          13   149.0000     1887.0000     11.4615      13.7870     3.7131     3.8647     4.0000    16.0000


                              ALL CLASSES

                   N     SUM         SUM**2        MEAN         VAR(N)      SD(N)      SD(N-1)     LOW        HIGH

PR1 ONLY          11   131.0000     1707.0000     11.9091      13.3554     3.6545     3.8329     5.0000    18.0000
PR2 ONLY          11    72.0000      590.0000      6.5455      10.7934     3.2853     3.4457     3.0000    12.0000
PR1 &POS          56   921.0000    16885.0000     16.4464      31.0328     5.5707     5.6211     4.0000    32.0000
PR2 &POS          56   461.0000     4439.0000      8.2321      11.4997     3.3911     3.4218     0.0       15.0000
POS &PRE          56   836.0000    14132.0000     14.9286      29.4949     5.4309     5.4801     4.0000    25.0000
POS ONLY          31   415.0000     6381.0000     13.3871      26.6243     5.1599     5.2452     4.0000    24.0000
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Table 5.2.1c (cont.)

CHEMISTRY 331 PRETEST
FORMULAS, EQUATIONS, STOICHIOMETRY (201) - (364)

College II

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	8	109.0000	1557.0000	13.6250	8.9844	2.9974	3.2043	11.0000	21.0000
PR2 ONLY	8	60.0000	546.0000	7.5000	12.0000	3.4641	3.7033	3.0000	13.0000
PR1 &PCS	50	767.0000	13191.0000	15.3400	28.5044	5.3390	5.3932	4.0000	32.0000
PR2 &PCS	50	395.0000	3731.0000	7.9000	12.2100	3.4943	3.5298	0.0	15.0000
PCS &PRE	50	549.0000	6679.0000	10.9800	13.0196	3.6083	3.6449	2.0000	20.0000
PCS ONLY	18	174.0000	2060.0000	9.6667	21.0000	4.5826	4.7154	1.0000	17.0000

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	2	20.0000	218.0000	10.0000	9.0000	3.0000	4.2426	7.0000	13.0000
PR2 ONLY	2	17.0000	169.0000	8.5000	12.2500	3.5000	4.9497	5.0000	12.0000
PR1 &PCS	7	156.0000	3626.0000	22.2857	21.3469	4.6203	4.9905	16.0000	30.0000
PR2 &PCS	7	61.0000	583.0000	8.7143	7.3469	2.7105	2.9277	5.0000	13.0000
PCS &PRE	7	83.0000	1049.0000	11.8571	9.2653	3.0439	3.2878	6.0000	16.0000
PCS ONLY	13	146.0000	1780.0000	11.2308	10.7929	3.2853	3.4194	7.0000	20.0000

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	10	129.0000	1775.0000	12.9000	11.0900	3.3302	3.5103	7.0000	21.0000
PR2 ONLY	10	77.0000	715.0000	7.7000	12.2100	3.4943	3.6833	3.0000	13.0000
PR1 &PCS	57	923.0000	16817.0000	16.1930	32.8224	5.7291	5.7800	4.0000	32.0000
PR2 &PCS	57	456.0000	4314.0000	8.0000	11.6842	3.4182	3.4486	0.0	15.0000
PCS &PRE	57	632.0000	7728.0000	11.0877	12.6414	3.5555	3.5871	2.0000	20.0000
PCS ONLY	31	320.0000	3840.0000	10.3226	17.3153	4.1612	4.2299	1.0000	20.0000

Table 5.2.1c (cont.)

CHEMISTRY 331 PRETEST
GASES (201) - (366)

College II

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	12	152.0000	2054.0000	12.6667	10.7222	3.2745	3.4201	5.0000	18.0000
PR2 ONLY	12	60.0000	370.0000	5.0000	5.8333	2.4152	2.5226	0.0	10.0000
PR1 &PCS	46	724.0000	12694.0000	15.7391	28.2363	5.3138	5.3725	4.0000	32.0000
PR2 &PCS	46	395.0000	3907.0000	8.5870	11.1990	3.3465	3.3835	2.0000	15.0000
PCS &PRE	46	465.0000	5179.0000	10.1087	10.4012	3.2251	3.2607	3.0000	18.0000
PCS ONLY	13	108.0000	1028.0000	8.3077	10.0592	3.1716	3.3011	3.0000	15.0000

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	2	20.0000	218.0000	10.0000	9.0000	3.0000	4.2426	7.0000	13.0000
PR2 ONLY	2	17.0000	169.0000	8.5000	12.2500	3.5000	4.9497	5.0000	12.0000
PR1 &PCS	7	156.0000	3626.0000	22.2857	21.3469	4.6203	4.9905	16.0000	30.0000
PR2 &PCS	7	61.0000	583.0000	8.7143	7.3469	2.7105	2.9277	5.0000	13.0000
PCS &PRE	7	63.0000	675.0000	9.0000	15.4286	3.9279	4.2426	3.0000	15.0000
PCS ONLY	10	92.0000	1014.0000	9.2000	16.7600	4.0939	4.3153	2.0000	16.0000

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	14	172.0000	2272.0000	12.2857	11.3469	3.3685	3.4957	5.0000	18.0000
PR2 ONLY	14	77.0000	539.0000	5.5000	8.2500	2.8723	2.9807	0.0	12.0000
PR1 &PCS	53	880.0000	16320.0000	16.6038	32.2392	5.6780	5.7323	4.0000	32.0000
PR2 &PCS	53	456.0000	4490.0000	8.6038	10.6921	3.2699	3.3012	2.0000	15.0000
PCS &PRE	53	528.0000	5854.0000	9.9623	11.2061	3.3476	3.3796	3.0000	18.0000
PCS ONLY	23	200.0000	2042.0000	8.6957	13.1682	3.6288	3.7104	2.0000	16.0000

Table 5.2.1c (cont.)

CHEMISTRY 331 PRETEST
SOLUTIONS (201) - (368)

College II

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	17	231.0000	3639.0000	13.5882	29.4187	5.4239	5.5908	5.0000	32.0000
PR2 ONLY	17	110.0000	930.0000	6.4706	12.8374	3.5829	3.6932	0.0	14.0000
PR1 &POS	41	645.0000	11109.0000	15.7317	23.4646	4.8440	4.9042	4.0000	26.0000
PR2 &POS	41	345.0000	3347.0000	8.4146	10.8281	3.2906	3.3315	2.0000	15.0000
POS &PRE	41	394.0000	4302.0000	9.6098	12.5794	3.5467	3.5908	2.0000	18.0000
POS ONLY	12	107.0000	1079.0000	8.9167	10.4097	3.2264	3.3699	5.0000	15.0000

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	2	20.0000	218.0000	10.0000	9.0000	3.0000	4.2426	7.0000	13.0000
PR2 ONLY	2	17.0000	169.0000	8.5000	12.2500	3.5000	4.9497	5.0000	12.0000
PR1 &POS	7	156.0000	3626.0000	22.2857	21.3469	4.6203	4.9905	16.0000	30.0000
PR2 &POS	7	61.0000	583.0000	8.7143	7.3469	2.7105	2.9277	5.0000	13.0000
POS &PRE	7	72.0000	852.0000	10.2857	15.9184	3.9898	4.3095	6.0000	17.0000
POS ONLY	7	62.0000	612.0000	8.8571	8.9796	2.9966	3.2367	6.0000	14.0000

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	19	251.0000	3857.0000	13.2105	28.4820	5.3369	5.4831	5.0000	32.0000
PR2 ONLY	19	127.0000	1099.0000	6.6842	13.1634	3.6281	3.7276	0.0	14.0000
PR1 &POS	48	801.0000	14735.0000	16.6875	28.5065	5.3391	5.3956	4.0000	30.0000
PR2 &POS	48	406.0000	3930.0000	8.4583	10.3316	3.2143	3.2483	2.0000	15.0000
POS &PRE	48	466.0000	5154.0000	9.7083	13.1233	3.6226	3.6609	2.0000	18.0000
POS ONLY	19	169.0000	1691.0000	8.8947	9.8837	3.1438	3.2300	5.0000	15.0000

Table 5.2.1c (cont.)

CHEMISTRY PRETEST (331)
ATOMIC STRUCTURE AND BONDING - (341)

College III

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	14	255.0000	5217.0000	18.2143	40.8827	6.3940	6.6353	4.0000	31.0000
PR2 ONLY	14	134.0000	1480.0000	9.5714	14.1020	3.7553	3.8970	1.0000	15.0000
PR1 &POS	53	879.0000	15719.0000	16.5849	21.5258	4.6396	4.6840	5.0000	28.0000
PR2 &POS	53	448.0000	4384.0000	8.4528	11.2666	3.3566	3.3867	0.0	15.0000
POS &PRE	53	813.0000	13971.0000	15.3396	26.2998	5.3198	5.3707	3.0000	27.0000
POS ONLY	4	65.0000	1155.0000	16.2500	24.6875	4.9687	5.7373	11.0000	24.0000

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	10	183.0000	3739.0000	18.3000	39.0100	6.2458	6.5836	11.0000	32.0000
PR2 ONLY	10	96.0000	1048.0000	9.6000	12.6400	3.5553	3.7476	2.0000	14.0000
PR1 &POS	30	547.0000	10607.0000	18.2333	21.1122	4.5948	4.6734	10.0000	28.0000
PR2 &POS	30	262.0000	2658.0000	8.7333	12.3289	3.5113	3.5713	2.0000	15.0000
POS &PRE	30	411.0000	6325.0000	13.7000	23.1433	4.8108	4.8930	4.0000	27.0000
POS ONLY	2	21.0000	221.0000	10.5000	0.2500	0.5000	0.7071	10.0000	11.0000

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	24	438.0000	8956.0000	18.2500	40.1042	6.3328	6.4690	4.0000	32.0000
PR2 ONLY	24	230.0000	2528.0000	9.5833	13.4931	3.6733	3.7523	1.0000	15.0000
PR1 &POS	83	1426.0000	26326.0000	17.1807	22.0035	4.6908	4.7193	5.0000	28.0000
PR2 &POS	83	710.0000	7042.0000	8.5542	11.6687	3.4160	3.4367	0.0	15.0000
POS &PRE	83	1224.0000	20296.0000	14.7470	27.0565	5.2016	5.2332	3.0000	27.0000
POS ONLY	6	86.0000	1376.0000	14.3333	23.8889	4.8876	5.3541	10.0000	24.0000

Table 5.2.1c (cont.)

CHEMISTRY 331 PRETEST
NOMENCLATURE - (342)

College III

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	18	310.0000	6100.0000	17.2222	42.2840	6.5026	6.6911	4.0000	31.0000
PR2 ONLY	18	159.0000	1651.0000	8.8333	13.6944	3.7006	3.8079	1.0000	15.0000
PR1 &POS	49	824.0000	14836.0000	16.8163	19.9867	4.4706	4.5170	8.0000	28.0000
PR2 &POS	49	423.0000	4213.0000	8.6327	11.4569	3.3848	3.4199	0.0	15.0000
POS &PRE	49	878.0000	17514.0000	17.9184	36.3607	6.0300	6.0925	5.0000	28.0000
POS ONLY	4	71.0000	1365.0000	17.7500	26.1875	5.1174	5.9090	13.0000	26.0000

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	12	223.0000	4547.0000	18.5833	33.5764	5.7945	6.0522	11.0000	32.0000
PR2 ONLY	12	109.0000	1173.0000	9.0833	15.2431	3.9042	4.0778	2.0000	14.0000
PR1 &POS	28	507.0000	9799.0000	18.1071	22.0957	4.7006	4.7869	10.0000	28.0000
PR2 &POS	28	249.0000	2533.0000	8.8929	11.3814	3.3736	3.4355	3.0000	15.0000
POS &PRE	28	442.0000	7898.0000	15.7857	32.8827	5.7343	5.8396	5.0000	26.0000
POS ONLY	1	5.0000	25.0000	5.0000	0.0	0.0	0.0	5.0000	5.0000

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	30	533.0000	10647.0000	17.7667	39.2456	6.2646	6.3717	4.0000	32.0000
PR2 ONLY	30	268.0000	2824.0000	8.9333	14.3289	3.7854	3.8501	1.0000	15.0000
PR1 &POS	77	1331.0000	24635.0000	17.2857	21.1391	4.5977	4.6279	8.0000	28.0000
PR2 &POS	77	672.0000	6746.0000	8.7273	11.4451	3.3831	3.4052	0.0	15.0000
POS &PRE	77	1320.0000	25412.0000	17.1429	36.1484	6.0124	6.0518	5.0000	26.0000
POS ONLY	5	76.0000	1390.0000	15.2000	46.9600	6.8527	7.6616	5.0000	26.0000

Table 5.2.1c (cont.)

CHEMISTRY 331 PRETEST
FORMULAS, EQUATICNS, STOICHIOMETRY - (343)

College III

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	25	427.0000	8379.0000	17.0800	43.4336	6.5904	6.7263	4.0000	31.0000
PR2 ONLY	25	226.0000	2362.0000	9.0400	12.7584	3.5719	3.6455	1.0000	15.0000
PR1 &POS	42	707.0000	12557.0000	16.8333	15.6151	3.9516	3.9995	8.0000	28.0000
PR2 &POS	42	356.0000	3502.0000	8.4762	11.5351	3.3963	3.4375	0.0	15.0000
POS &PRE	42	588.0000	10096.0000	14.0000	44.3810	6.6619	6.7427	2.0000	25.0000
POS ONLY	4	49.0000	671.0000	12.2500	17.6875	4.2057	4.8563	6.0000	17.0000

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	15	281.0000	5737.0000	18.7333	31.5289	5.6151	5.8121	11.0000	32.0000
PR2 ONLY	15	141.0000	1547.0000	9.4000	14.7733	3.8436	3.9785	2.0000	15.0000
PR1 &POS	25	449.0000	8609.0000	17.9600	21.7984	4.6689	4.7652	10.0000	28.0000
PR2 &POS	25	217.0000	2159.0000	8.6800	11.0176	3.3193	3.3877	3.0000	15.0000
POS &PRE	25	277.0000	3807.0000	11.0800	29.5136	5.4326	5.5447	2.0000	21.0000
POS ONLY	1	10.0000	100.0000	10.0000	0.0	0.0	0.0	10.0000	10.0000

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	40	708.0000	14116.0000	17.7000	39.6100	6.2936	6.3738	4.0000	32.0000
PR2 ONLY	40	367.0000	3909.0000	9.1750	13.5444	3.6803	3.7272	1.0000	15.0000
PR1 &POS	67	1156.0000	21166.0000	17.2537	18.2192	4.2684	4.3006	8.0000	28.0000
PR2 &POS	67	573.0000	[illegible]	8.5522	[illegible]	[illegible]	[illegible]	0.0	16.0000
POS &PRE	67	865.0000	13903.0000	12.9104	[illegible]	[illegible]	[illegible]	2.0000	25.0000
POS ONLY	5	59.0000	771.0000	11.8000	[illegible]	[illegible]	[illegible]	6.0000	17.0000

Table 5.2.1c (cont.)

CHEMISTRY 331 PRETEST
GASES PRETEST - (344)

College III

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	24	413.0000	7955.0000	17.2083	35.3316	5.9440	6.0719	4.0000	31.0000
PR2 ONLY	24	215.0000	2217.0000	8.9583	12.1233	3.4818	3.5567	1.0000	15.0000
PR1 &POS	43	721.0000	12981.0000	16.7674	20.7366	4.5537	4.6076	8.0000	28.0000
PR2 &POS	43	367.0000	3647.0000	8.5349	11.9697	3.4597	3.5007	0.0	15.0000
POS &PRE	43	148.0000	612.0000	3.4419	2.3862	1.5447	1.5630	1.0000	8.0000
POS ONLY	3	10.0000	46.0000	3.3333	4.2222	2.0548	2.5166	1.0000	6.0000

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	14	276.0000	5952.0000	19.7143	36.4898	6.0407	6.2687	11.0000	32.0000
PR2 ONLY	14	134.0000	1498.0000	9.5714	15.3878	3.9227	4.0708	2.0000	15.0000
PR1 &POS	26	454.0000	8394.0000	17.4615	17.9408	4.2357	4.3195	10.0000	28.0000
PR2 &POS	26	224.0000	2206.0000	8.6154	10.6982	3.2708	3.3356	3.0000	15.0000
POS &PRE	26	82.0000	348.0000	3.1538	3.4379	1.8541	1.8909	1.0000	10.0000
POS ONLY	1	1.0000	1.0000	1.0000	0.0	0.0	0.0	1.0000	1.0000

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	38	689.0000	13907.0000	18.1316	37.2195	6.1008	6.1827	4.0000	32.0000
PR2 ONLY	38	349.0000	3715.0000	9.1842	13.4134	3.6624	3.7116	1.0000	15.0000
PR1 &POS	69	1175.0000	21375.0000	17.0290	19.7963	4.4493	4.4819	8.0000	28.0000
PR2 &POS	69	591.0000	5855.0000	8.5652	11.4921	3.3900	3.4148	0.0	15.0000
POS &PRE	69	230.0000	960.0000	3.3333	2.8019	1.6739	1.6862	1.0000	10.0000
POS ONLY	4	11.0000	47.0000	2.7500	4.1875	2.0463	2.3629	1.0000	6.0000

Table 5.2.1c (cont.)

CHEMISTRY 331 PRETEST
GASES POSTTEST - (345)

College III

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	27	450.0000	8514.0000	16.6667	37.5556	6.1283	6.2450	4.0000	31.0000
PR2 ONLY	27	230.0000	2284.0000	8.5185	12.0274	3.4681	3.5341	1.0000	15.0000
PR1 &POS	40	684.0000	12422.0000	17.1000	18.1400	4.2591	4.3134	8.0000	28.0000
PR2 &POS	40	352.0000	3580.0000	8.8000	12.0600	3.4728	3.5170	0.0	15.0000
POS &PRE	40	550.0000	8276.0000	13.7500	17.8375	4.2234	4.2773	6.0000	21.0000
POS ONLY	3	48.0000	624.0000	16.0000	18.6667	4.3205	5.2915	10.0000	20.0000

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	13	249.0000	5223.0000	19.1538	34.8994	5.9076	6.1488	11.0000	32.0000
PR2 ONLY	13	119.0000	1273.0000	9.1538	14.1302	3.7590	3.9125	2.0000	14.0000
PR1 &POS	27	481.0000	9123.0000	17.8148	20.5213	4.5300	4.6163	10.0000	28.0000
PR2 &POS	27	239.0000	2433.0000	8.8519	11.7558	3.4287	3.4940	3.0000	15.0000
POS &PRE	27	314.0000	4170.0000	11.6296	19.1962	4.3813	4.4648	3.0000	22.0000
POS ONLY	1	12.0000	144.0000	12.0000	0.0	0.0	0.0	12.0000	12.0000

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	40	699.0000	13737.0000	17.4750	38.0494	6.1684	6.2470	4.0000	32.0000
PR2 ONLY	40	349.0000	3557.0000	8.7250	12.7994	3.5776	3.6232	1.0000	15.0000
PR1 &PUS	67	1165.0000	21545.0000	17.3881	19.2225	4.3844	4.4174	8.0000	28.0000
PR2 &PUS	67	591.0000	6013.0000	8.8209	11.9381	3.4552	3.4812	0.0	15.0000
POS &PRE	67	864.0000	12446.0000	12.8955	19.4667	4.4121	4.4454	3.0000	22.0000
POS ONLY	4	60.0000	968.0000	15.0000	17.0000	4.1231	4.7610	10.0000	20.0000

Table 5.2.1c (cont.)

CHEMISTRY 331 PRETEST
SOLUTIONS - (346)

College III

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	13	224.0000	4644.0000	17.2308	60.3314	7.7673	8.0845	4.0000	31.0000
PR2 ONLY	13	132.0000	1472.0000	10.1538	10.1302	3.1828	3.3128	5.0000	15.0000
PR1 &POS	20	353.0000	6579.0000	17.6500	17.4275	4.1746	4.2831	8.0000	25.0000
PR2 &POS	20	192.0000	2096.0000	9.6000	12.6400	3.5553	3.6476	3.0000	15.0000
POS &PRE	20	198.0000	2150.0000	9.9000	9.4900	3.0806	3.1606	4.0000	15.0000
POS ONLY	2	20.0000	208.0000	10.0000	4.0000	2.0000	2.8284	8.0000	12.0000

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	13	249.0000	5223.0000	19.1538	34.8994	5.9076	6.1488	11.0000	32.0000
PR2 ONLY	13	119.0000	1273.0000	9.1538	14.1302	3.7590	3.9125	2.0000	14.0000
PR1 &POS	27	481.0000	9123.0000	17.8148	20.5213	4.5300	4.6163	10.0000	28.0000
PR2 &POS	27	239.0000	2433.0000	8.8519	11.7558	3.4287	3.4940	3.0000	15.0000
POS &PRE	27	228.0000	2194.0000	8.4444	9.9506	3.1545	3.2146	3.0000	16.0000
POS ONLY	1	6.0000	36.0000	6.0000	0.0	0.0	0.0	6.0000	6.0000

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	26	473.0000	9867.0000	18.1923	48.5399	6.9671	7.1050	4.0000	32.0000
PR2 ONLY	26	251.0000	2745.0000	9.6538	12.3802	3.5185	3.5882	2.0000	15.0000
PR1 &POS	47	834.0000	15702.0000	17.7447	19.2114	4.3831	4.4305	8.0000	28.0000
PR2 &POS	47	431.0000	4529.0000	9.1702	12.2689	3.5027	3.5406	3.0000	15.0000
POS &PRE	47	426.0000	4344.0000	9.0638	10.2725	3.2051	3.2397	3.0000	16.0000
POS ONLY	3	26.0000	244.0000	8.6667	6.2222	2.4944	3.0551	6.0000	12.0000

Table 5.2.1c (cont.)

CHEMISTRY 331 PRETEST
STOICHIOMETRY AND NUCLEAR STRUCTURE - (351)

College IV

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	12	226.0000	4530.0000	18.8333	22.8056	4.7755	4.9879	12.0000	26.0000
PR2 ONLY	12	121.0000	1317.0000	10.0833	8.0764	2.8419	2.9683	5.0000	14.0000
PR1 &POS	54	1366.0000	35824.0000	25.2963	23.5048	4.8482	4.8937	15.0000	36.0000
PR2 &POS	54	673.0000	8633.0000	12.4630	4.5449	2.1319	2.1519	6.0000	15.0000
POS &PRE	54	991.0000	19117.0000	18.3519	17.2281	4.1507	4.1896	6.0000	25.0000
POS ONLY	1	11.0000	121.0000	11.0000	0.0	0.0	0.0	11.0000	11.0000

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	12	229.0000	4643.0000	19.0833	22.7431	4.7690	4.9810	13.0000	27.0000
PR2 ONLY	12	120.0000	1310.0000	10.0000	9.1667	3.0277	3.1623	4.0000	14.0000
PR1 &POS	55	1441.0000	39557.0000	26.2000	32.7782	5.7252	5.7780	11.0000	38.0000
PR2 &POS	55	697.0000	9005.0000	12.6727	3.1293	1.7690	1.7853	8.0000	15.0000
POS &PRE	55	1028.0000	20110.0000	18.6909	16.2863	4.0356	4.0728	8.0000	25.0000
POS ONLY	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	24	455.0000	9173.0000	18.9583	22.7899	4.7739	4.8766	12.0000	27.0000
PR2 ONLY	24	241.0000	2627.0000	10.0417	8.6233	2.9365	2.9997	4.0000	14.0000
PR1 &POS	109	2807.0000	75381.0000	25.7523	28.3882	5.3281	5.3527	11.0000	38.0000
PR2 &POS	109	1370.0000	17638.0000	12.5688	3.8416	1.9600	1.9691	6.0000	15.0000
POS &PRE	109	2019.0000	39227.0000	18.5229	16.7816	4.0965	4.1155	6.0000	25.0000
POS ONLY	1	11.0000	121.0000	11.0000	0.0	0.0	0.0	11.0000	11.0000

Table 5.2.1c (cont.)

CHEMISTRY 331 PRETEST
BONDING AND NOMENCLATURE - (352)

College IV

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	20	396.0000	8486.0000	19.8000	32.2600	5.6798	5.8273	12.0000	36.0000
PR2 ONLY	20	222.0000	2652.0000	11.1000	9.3900	3.0643	3.1439	5.0000	15.0000
PR1 &POS	46	1196.0000	31868.0000	26.0000	16.7826	4.0967	4.1419	17.0000	35.0000
PR2 &POS	46	572.0000	7298.0000	12.4348	4.0284	2.0071	2.0293	7.0000	15.0000
POS &PRE	46	959.0000	21213.0000	20.8478	26.5203	5.1498	5.2067	8.0000	30.0000
POS ONLY	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	19	404.0000	9060.0000	21.2632	24.7202	4.9719	5.1082	13.0000	28.0000
PR2 ONLY	19	209.0000	2455.0000	11.0000	8.2105	2.8654	2.9439	4.0000	15.0000
PR1 &POS	48	1266.0000	35140.0000	26.3750	36.4427	6.0368	6.1007	11.0000	38.0000
PR2 &POS	48	608.0000	7860.0000	12.6667	3.3056	1.8181	1.8374	8.0000	15.0000
POS &PRE	48	970.0000	20754.0000	20.2083	23.9983	4.8988	4.9506	8.0000	29.0000
POS ONLY	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	39	800.0000	17546.0000	20.5128	29.1216	5.3964	5.4670	12.0000	36.0000
PR2 ONLY	39	431.0000	5107.0000	11.0513	8.8179	2.9695	3.0083	4.0000	15.0000
PR1 &POS	94	2462.0000	67008.0000	26.1915	26.8569	5.1824	5.2102	11.0000	38.0000
PR2 &POS	94	1180.0000	15158.0000	12.5532	3.6727	1.9164	1.9267	7.0000	15.0000
POS &PRE	94	1929.0000	41967.0000	20.5213	25.3347	5.0334	5.0603	8.0000	30.0000
POS ONLY	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 5.2.1c (cont.)

CHEMISTRY 331 PRETEST
GASES POSTTEST - (354)

College IV

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	15	302.0000	6628.0000	20.1333	36.5156	6.0428	6.2549	12.0000	36.0000
PR2 ONLY	15	163.0000	1905.0000	10.8667	8.9156	2.9859	3.0907	5.0000	14.0000
PR1 &POS	51	1290.0000	33726.0000	25.2941	21.5017	4.6370	4.6831	15.0000	35.0000
PR2 &POS	51	631.0000	8045.0000	12.3725	4.6651	2.1599	2.1814	6.0000	15.0000
POS &PRE	51	819.0000	14033.0000	16.0588	17.2710	4.1558	4.1972	7.0000	24.0000
POS ONLY	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	17	359.0000	8047.0000	21.1176	27.3979	5.2343	5.3954	13.0000	28.0000
PR2 ONLY	17	183.0000	2109.0000	10.7647	8.1799	2.8601	2.9481	4.0000	14.0000
PR1 &POS	50	1311.0000	36153.0000	26.2200	35.5716	5.9642	6.0247	11.0000	38.0000
PR2 &POS	50	634.0000	8206.0000	12.6800	3.3376	1.8269	1.8455	8.0000	15.0000
POS &PRE	50	873.0000	15797.0000	17.4600	11.0884	3.3299	3.3637	10.0000	24.0000
POS ONLY	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	32	661.0000	14675.0000	20.6563	31.9131	5.6492	5.7396	12.0000	36.0000
PR2 ONLY	32	346.0000	4014.0000	10.8125	8.5273	2.9202	2.9669	4.0000	14.0000
PR1 &POS	101	2601.0000	69879.0000	25.7525	28.6813	5.3555	5.3822	11.0000	38.0000
PR2 &POS	101	1265.0000	16251.0000	12.5248	4.0316	2.0079	2.0179	6.0000	15.0000
POS &PRE	101	1692.0000	29830.0000	16.7525	14.7011	3.8342	3.8533	7.0000	24.0000
POS ONLY	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 5.2.1d

English

Fall 1975

College I

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ENGLISH PRETEST (531)
ENGLISH POSTTEST (591), ENGLISH 100 CLASSES

                            ALL PLATO CLASSES

                     N        SUM          SUM**2        MEAN         VAR(N)      SD(N)     SD(N-1)     LOW        HIGH

PRE ONLY            32      556.0000     11334.0000     17.3750       52.2969     7.2317     7.3474     6.0000     33.0000
PRE &POS            49      928.0000     20238.0000     18.9388       54.3432     7.3718     7.4492     4.0000     32.0000
POS &PRE            49      963.0000     21379.0000     19.6531       50.0635     7.0755     7.1489     4.0000     32.0000
POS ONLY             4       73.0000      1493.0000     18.2500       40.1875     6.3394     7.3201    12.0000     26.0000


                            ALL NON PLATO CLASSES

                     N        SUM          SUM**2        MEAN         VAR(N)      SD(N)     SD(N-1)     LOW        HIGH

PRE ONLY            38      714.0000     15404.0000     18.7895       52.3241     7.2335     7.3366     5.0000     35.0000
PRE &POS            39      651.0000     12581.0000     16.6923       43.9566     6.6300     6.7166     6.0000     32.0000
POS &PRE            39      725.0000     15105.0000     18.5897       41.7291     6.4598     6.5443     7.0000     32.0000
POS ONLY             8      119.0000      2075.0000     14.8750       38.1094     6.1733     6.5995     5.0000     24.0000


                            ALL CLASSES

                     N        SUM          SUM**2        MEAN         VAR(N)      SD(N)     SD(N-1)     LOW        HIGH

PRE ONLY            70     1270.0000     26738.0000     18.1429       52.8082     7.2669     7.3194     5.0000     33.0000
PRE &POS            88     1579.0000     32819.0000     17.9432       50.9854     7.1404     7.1813     4.0000     32.0000
POS &PRE            88     1688.0000     36484.0000     19.1818       46.6488     6.8300     6.8691     4.0000     32.0000
POS ONLY            12      192.0000      3568.0000     16.0000       41.3333     6.4291     6.7150     5.0000     26.0000
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Table 5.2.1d (cont.)

College III

ENGLISH PRETEST (531)
ENGLISH POSTTEST (591), ENGLISH 100 CLASSES

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	33	663.0000	15477.0000	20.0909	65.3554	8.0843	8.2096	4.0000	35.0000
PRE &POS	43	959.0000	23457.0000	22.3023	48.3505	6.9534	7.0357	10.0000	37.0000
POS &PRE	43	1070.0000	28104.0000	24.8837	34.3818	5.8636	5.9330	16.0000	37.0000
POS ONLY	4	75.0000	1565.0000	18.7500	39.6875	6.2998	7.2744	8.0000	24.0000

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	38	849.0000	21479.0000	22.3421	66.0672	8.1282	8.2373	1.0000	36.0000
PRE &POS	61	1378.0000	34552.0000	22.5902	56.1107	7.4907	7.5529	4.0000	37.0000
POS &PRE	61	1374.0000	33840.0000	22.5246	47.3969	6.8845	6.9417	8.0000	37.0000
POS ONLY	5	103.0000	2223.0000	20.6000	20.2400	4.4989	5.0299	16.0000	29.0000

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	71	1512.0000	36956.0000	21.2958	66.9970	8.1852	8.2434	1.0000	36.0000
PRE &POS	104	2337.0000	58019.0000	22.4712	52.9222	7.2748	7.3100	4.0000	37.0000
POS &PRE	104	2444.0000	61944.0000	23.5000	43.3654	6.5852	6.6171	8.0000	37.0000
POS ONLY	9	178.0000	3788.0000	19.7778	29.7284	5.4524	5.7831	8.0000	29.0000

Table 5.2.1d (cont.)

College I

ENGLISH PRETEST (531)
ENGLISH POSTTEST (591), ENGLISH 101 CLASSES

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	30	565.0000	12257.0000	18.8333	53.2056	7.2942	7.4189	3.0000	31.0000
PRE &POS	40	709.0000	14625.0000	17.7250	51.5494	7.1798	7.2713	7.0000	35.0000
POS &PRE	40	836.0000	19694.0000	20.9000	55.5400	7.4525	7.5475	7.0000	35.0000
POS ONLY	6	135.0000	3463.0000	22.5000	70.9167	8.4212	9.2250	13.0000	33.0000

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	57	1112.0000	25476.0000	19.5088	66.3552	8.1459	8.2183	5.0000	39.0000
PRE &POS	69	1439.0000	33141.0000	20.8551	45.3703	6.7357	6.7851	8.0000	37.0000
POS &PRE	69	1559.0000	39167.0000	22.5942	57.1357	7.5591	7.6145	3.0000	38.0000
POS ONLY	18	407.0000	10167.0000	22.6111	53.5710	7.3192	7.5314	9.0000	38.0000

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	87	1677.0000	37713.0000	19.2759	61.9239	7.8692	7.9148	3.0000	39.0000
PRE &POS	109	2148.0000	47770.0000	19.7064	49.9138	7.0650	7.0976	7.0000	37.0000
POS &PRE	109	2395.0000	58861.0000	21.9725	57.2194	7.5644	7.5993	3.0000	38.0000
POS ONLY	24	542.0000	13650.0000	22.5833	57.9097	7.6098	7.7735	9.0000	38.0000

Table 5.2.1d (cont.)

College II

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ENGLISH PRETEST (531)
ENGLISH POSTTEST (591), ENGLISH 101 CLASSES

                        ALL PLATO CLASSES

                 N        SUM         SUM**2        MEAN         VAR(N)      SD(N)     SD(N-1)       LOW        HIGH

PRE ONLY        53      959.0000    20425.0000    18.0943       57.9722     7.6139     7.6868      3.0000     36.0000
PRE &POS        49      880.0000    18424.0000    17.9592       53.4677     7.3122     7.3879      4.0000     39.0000
POS &PRE        49     1062.0000    25806.0000    21.6735       56.9138     7.5441     7.6223      7.0000     39.0000
POS ONLY         5       90.0000     1938.0000    18.0000       63.6000     7.9750     8.9163     10.0000     33.0000


                        ALL NON PLATO CLASSES

                 N        SUM         SUM**2        MEAN         VAR(N)      SD(N)     SD(N-1)       LOW        HIGH

PRE ONLY        81     1397.0000    28513.0000    17.2469       54.5563     7.3862     7.4322      4.0000     35.0000
PRE &POS        41      766.0000    16582.0000    18.6829       55.3873     7.4423     7.5347      4.0000     34.0000
POS &PRE        41      941.0000    23245.0000    22.9512       40.1927     6.3398     6.4165     11.0000     36.0000
POS ONLY         6      108.0000     2330.0000    18.0000       64.3333     8.0208     8.7864      8.0000     28.0000


                        ALL CLASSES

                 N        SUM         SUM**2        MEAN         VAR(N)      SD(N)     SD(N-1)       LOW        HIGH

PRE ONLY       134     2356.0000    48938.0000    17.5821       56.0791     7.4886     7.5167      3.0000     36.0000
PRE &POS        90     1646.0000    35006.0000    18.2889       54.4721     7.3805     7.4219      4.0000     39.0000
POS &PRE        90     2003.0000    49051.0000    22.2556       49.7014     7.0499     7.0894      7.0000     39.0000
POS ONLY        11      198.0000     4268.0000    18.0000       64.0000     8.0000     8.3905      8.0000     33.0000
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Table 5.2.1d (cont.)

College III

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ENGLISH PRETEST (531)
ENGLISH POSTTEST (591), ENGLISH 101 CLASSES

                     ALL PLATO CLASSES

               N       SUM        SUM**2       MEAN        VAR(N)      SD(N)    SD(N-1)      LOW        HIGH

PRE ONLY      13    325.0000     9163.0000   25.3077      64.3669     8.0229     8.3505    10.0000    36.0000
PRE &POS      34    979.0000    30135.0000   28.7941      57.2223     7.5645     7.6783    13.0000    39.0000
POS &PRE      34   1018.0000    31602.0000   29.9412      32.9965     5.7443     5.8306    17.0000    38.0000
POS ONLY       3     80.0000     2216.0000   26.6667      27.5556     5.2493     6.4291    22.0000    34.0000


                     ALL NON PLATO CLASSES

               N       SUM        SUM**2       MEAN        VAR(N)      SD(N)    SD(N-1)      LOW        HIGH

PRE ONLY      51   1469.0000    44301.0000   28.8039      38.9812     6.2435     6.3056    11.0000    38.0000
PRE &POS      64   1828.0000    55266.0000   28.5625      47.7148     6.9076     6.9622    11.0000    39.0000
POS &PRE      64   1941.0000    61035.0000   30.3281      33.9392     5.8257     5.8718    11.0000    39.0000
POS ONLY       6    124.0000     2918.0000   20.6667      59.2222     7.6956     8.4301    10.0000    32.0000


                     ALL CLASSES

               N       SUM        SUM**2       MEAN        VAR(N)      SD(N)    SD(N-1)      LOW        HIGH

PRE ONLY      64   1798.0000    53464.0000   28.0938      46.1162     6.7909     6.8446    10.0000    38.0000
PRE &POS      98   2807.0000    85401.0000   28.6429      51.0255     7.1432     7.1799    11.0000    39.0000
POS &PRE      98   2959.0000    92641.0000   30.1939      33.6461     5.8005     5.8303    11.0000    39.0000
POS ONLY       9    204.0000     5134.0000   22.6667      56.6667     7.5277     7.9844    10.0000    34.0000
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Table 5.2.1d (cont.)

College IV

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ENGLISH PRETEST (531)
ENGLISH POSTTEST (591), ENGLISH 101 CLASSES

                                ALL PLATO CLASSES

                     N        SUM          SUM**2         MEAN          VAR(N)        SD(N)       SD(N-1)        LOW          HIGH

PRE ONLY             4      139.0000      4893.0000     34.7500        15.6875       3.9607       4.5735       30.0000       40.0000
PRE &POS            42     1287.0000     40823.0000     30.6429        32.9915       5.7438       5.8134       16.0000       38.0000
POS &PRE            42     1341.0000     44533.0000     31.9286        40.8759       6.3934       6.4709       17.0000       40.0000
POS ONLY             4      114.0000      3258.0000     28.5000         2.2500       1.5000       1.7321       27.0000       31.0000


                                ALL NON PLATO CLASSES

                     N        SUM          SUM**2         MEAN          VAR(N)        SD(N)       SD(N-1)        LOW          HIGH

PRE ONLY             2       53.0000      1405.0000     26.5000         0.2500       0.5000       0.7071       26.0000       27.0000
PRE &POS            26      775.0000     23857.0000     29.8077        29.0734       5.3924       5.4992       15.0000       38.0000
POS &PRE            26      776.0000     23786.0000     29.8462        24.0533       4.9044       5.0015       15.0000       38.0000
POS ONLY             4      135.0000      4565.0000     33.7500         3.1875       1.7854       2.0616       32.0000       36.0000


                                ALL CLASSES

                     N        SUM          SUM**2         MEAN          VAR(N)        SD(N)       SD(N-1)        LOW          HIGH

PRE ONLY             6      192.0000      6298.0000     32.0000        25.6667       5.0662       5.5498       26.0000       40.0000
PRE &POS            68     2062.0000     64680.0000     30.3235        31.6600       5.6267       5.6680       15.0000       38.0000
POS &PRE            68     2117.0000     68319.0000     31.1324        35.4678       5.9555       5.9998       15.0000       40.0000
POS ONLY             8      249.0000      7827.0000     31.1250         9.6094       3.0999       3.3139       27.0000       36.0000
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Table 5.2.1e
Mathematics
Fall 1975

College I

MATHEMATICS PRETEST (431)
MATHEMATICS 111 TEST - (491)

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	32	669.0000	15215.0000	20.9063	38.3975	6.1966	6.2957	10.0000	37.0000
PRE &POS	17	498.0000	16952.0000	29.2941	139.0311	11.7911	12.1540	12.0000	60.0000
POS &PRE	17	348.0000	7710.0000	20.4706	34.4844	5.8723	6.0531	10.0000	31.0000
POS ONLY	5	80.0000	1314.0000	16.0000	6.8000	2.6077	2.9155	12.0000	19.0000

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	28	754.0000	22872.0000	26.9286	91.7092	9.5765	9.7522	8.0000	47.0000
PRE &POS	34	993.0000	32761.0000	29.2059	110.5753	10.5155	10.6736	9.0000	55.0000
POS &PRE	34	537.0000	9451.0000	15.7941	28.5164	5.3401	5.4204	8.0000	29.0000
POS ONLY	6	94.0000	1520.0000	15.6667	7.8889	2.8087	3.0768	12.0000	21.0000

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	60	1423.0000	38087.0000	23.7167	72.3031	8.5031	8.5749	8.0000	47.0000
PRE &POS	51	1491.0000	49713.0000	29.2353	120.0623	10.9573	11.0663	9.0000	60.0000
POS &PRE	51	885.0000	17161.0000	17.3529	35.3656	5.9469	6.0061	8.0000	31.0000
POS ONLY	11	174.0000	2834.0000	15.8182	7.4215	2.7242	2.8572	12.0000	21.0000

Table 5.2.1f

Accounting
Spring 1976

College I

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ACCOUNTING PRETEST (131)
FINAL EXAMINATION IN ACCOUNTING 101 - (191)

                        ALL PLATO CLASSES

                   N       SUM          SUM**2        MEAN        VAR(N)       SD(N)     SD(N-1)       LOW        HIGH

PRE ONLY          17     380.0000     8948.0000     22.3529      26.6990      5.1671      5.3261     11.0000     30.0000
PRE &POS           7     160.0000     3776.0000     22.8571      16.9796      4.1206      4.4508     18.0000     31.0000
POS &PRE           7     130.0000     2752.0000     18.5714      48.2449      6.9459      7.5024      9.0000     28.0000
POS ONLY           2      23.0000      265.0000     11.5000       0.2500      0.5000      0.7071     11.0000     12.0000


                        ALL NON PLATO CLASSES

                   N       SUM          SUM**2        MEAN        VAR(N)       SD(N)     SD(N-1)       LOW        HIGH

PRE ONLY          23     536.0000    13044.0000     23.3043      24.0378      4.9028      5.0130     15.0000     33.0000
PRE &POS           9     213.0000     5263.0000     23.6667      24.6667      4.9666      5.2678     17.0000     33.0000
POS &PRE           9     202.0000     4802.0000     22.4444      29.6025      5.4592      5.7903     16.0000     31.0000
POS ONLY           0       0.0           0.0         0.0          0.0        0.0         0.0         0.0         0.0


                        ALL CLASSES

                   N       SUM          SUM**2        MEAN        VAR(N)       SD(N)     SD(N-1)       LOW        HIGH

PRE ONLY          40     916.0000    21992.0000     22.9000      25.3900      5.0388      5.1030     11.0000     33.0000
PRE &POS          16     373.0000     9039.0000     23.3125      21.4648      4.6330      4.7850     17.0000     33.0000
POS &PRE          16     332.0000     7554.0000     20.7500      41.5625      6.4469      6.6583      9.0000     31.0000
POS ONLY           2      23.0000      265.0000     11.5000       0.2500      0.5000      0.7071     11.0000     12.0000
```

Table 5.2.1f (cont.)

ACCOUNTING PRETEST (131)
INTRODUCTORY ACCOUNTING - (192)

College III

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	28	738.0000	19960.0000	26.3571	18.1582	4.2612	4.3394	15.0000	32.0000
PRE &POS	45	1260.0000	36070.0000	28.0000	17.5556	4.1899	4.2373	16.0000	37.0000
POS &PRE	45	1496.0000	54972.0000	33.2444	116.4069	10.7892	10.9111	9.0000	50.0000
POS ONLY	1	49.0000	2401.0000	49.0000	0.0	0.0	0.0	49.0000	49.0000

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	19	478.0000	12446.0000	25.1579	22.1330	4.7046	4.8335	18.0000	34.0000
PRE &POS	45	1250.0000	35808.0000	27.7778	24.1284	4.9121	4.9676	16.0000	38.0000
POS &PRE	45	1533.0000	56663.0000	34.0667	98.6400	9.9318	10.0440	14.0000	49.0000
POS ONLY	4	110.0000	3226.0000	27.5000	50.2500	7.0887	8.1854	19.0000	35.0000

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	47	1216.0000	32406.0000	25.8723	20.1114	4.4846	4.5331	15.0000	34.0000
PRE &POS	90	2510.0000	71878.0000	27.8889	20.8543	4.5667	4.5922	16.0000	38.0000
POS &PRE	90	3029.0000	111635.0000	33.6556	107.6925	10.3775	10.4356	9.0000	50.0000
POS ONLY	5	159.0000	5627.0000	31.8000	114.1600	10.6846	11.9457	19.0000	49.0000

Table 5.2.1g

Biology
Spring 1976
College I

BIOLOGY PRETEST I (231)
BIOLOGY 111 TEST - (292)

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	26	550.0000	12706.0000	21.1538	41.2071	6.4193	6.5464	10.0000	36.0000
PRE &POS	69	1439.0000	32191.0000	20.8551	31.6022	5.6216	5.6028	9.0000	36.0000
POS &PRE	69	1496.0000	34714.0000	21.6812	33.0288	5.7471	5.7892	9.0000	34.0000
POS ONLY	10	173.0000	3133.0000	17.3000	14.0100	3.7430	3.9455	10.0000	22.0000

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	30	591.0000	12877.0000	19.7000	41.1433	6.4143	6.5240	10.0000	36.0000
PRE &POS	35	639.0000	12655.0000	18.2571	28.2482	5.3149	5.3925	7.0000	33.0000
POS &PRE	35	597.0000	11387.0000	17.0571	34.3967	5.8649	5.9505	8.0000	40.0000
POS ONLY	2	43.0000	1145.0000	21.5000	110.2500	10.5000	14.8492	11.0000	32.0000

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	56	1141.0000	25583.0000	20.3750	41.6987	6.4575	6.5159	10.0000	36.0000
PRE &POS	104	2078.0000	44646.0000	19.9808	31.9804	5.6551	5.6825	7.0000	36.0000
POS &PRE	104	2093.0000	46101.0000	20.1250	38.2632	6.1857	6.2157	8.0000	40.0000
POS ONLY	12	216.0000	4278.0000	18.0000	32.5000	5.7009	5.9544	10.0000	32.0000

Table 5.2.1g (cont.)

BIOLOGY PRETEST II (232)
BIOLOGY 102 TEST - (295)

College II

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	8	86.0000	1048.0000	10.7500	15.4375	3.9291	4.2003	4.0000	17.0000
PRE &POS	14	209.0000	3595.0000	14.9286	33.9235	5.8244	6.0443	6.0000	24.0000
POS &PRE	14	397.0000	12683.0000	28.3571	101.8010	10.0896	10.4703	9.0000	45.0000
POS ONLY	4	100.0000	3042.0000	25.0000	135.5000	11.6404	13.4412	6.0000	35.0000

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	7	70.0000	712.0000	10.0000	1.7143	1.3093	1.4142	8.0000	12.0000
PRE &POS	26	382.0000	5986.0000	14.6923	14.3669	3.7904	3.8654	9.0000	22.0000
POS &PRE	26	712.0000	20642.0000	27.3846	44.0059	6.6337	6.7651	15.0000	40.0000
POS ONLY	13	346.0000	9640.0000	26.6154	33.1598	5.7585	5.9936	18.0000	42.0000

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	15	156.0000	1760.0000	10.4000	9.1733	3.0288	3.1351	4.0000	17.0000
PRE &POS	40	591.0000	9581.0000	14.7750	21.2244	4.6070	4.6657	6.0000	24.0000
POS &PRE	40	1109.0000	33325.0000	27.7250	64.4494	8.0280	8.1335	9.0000	45.0000
POS ONLY	17	446.0000	12652.0000	26.2353	57.7093	7.5967	7.8305	6.0000	42.0000

Table 5.2.1g (cont.)

BIOLOGY PRETEST II (232)
BIOLOGY 102 TEST - (294)

College III

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	19	282.0000	4764.0000	14.8421	30.4488	5.5180	5.6692	7.0000	27.0000
PRE &POS	30	468.0000	8208.0000	15.6000	30.2400	5.4991	5.5931	6.0000	26.0000
POS &PRE	30	687.0000	17225.0000	22.9000	49.7567	7.0538	7.1744	8.0000	36.0000
POS ONLY	2	40.0000	808.0000	20.0000	4.0000	2.0000	2.8284	18.0000	22.0000

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	10	137.0000	2009.0000	13.7000	13.2100	3.6346	3.8312	9.0000	20.0000
PRE &POS	13	173.0000	2535.0000	13.3077	17.9053	4.2315	4.4043	5.0000	21.0000
POS &PRE	13	315.0000	7835.0000	24.2308	15.5621	3.9449	4.1060	18.0000	34.0000
POS ONLY	2	58.0000	1754.0000	29.0000	36.0000	6.0000	8.4853	23.0000	35.0000

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	29	419.0000	6773.0000	14.4483	24.7990	4.9799	5.0680	7.0000	27.0000
PRE &POS	43	641.0000	10743.0000	14.9070	27.6193	5.2554	5.3176	5.0000	26.0000
POS &PRE	43	1002.0000	25060.0000	23.3023	39.7923	6.3081	6.3828	8.0000	36.0000
POS ONLY	4	98.0000	2562.0000	24.5000	40.2500	6.3443	7.3258	18.0000	35.0000

Table 5.2.1g (cont.)

BIOLOGY PRETEST II (232)
BIOLOGY 112 TEST - (293)

College I

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	11	146.0000	2338.0000	13.2727	36.3802	6.0316	6.3260	5.0000	24.0000
PRE &POS	47	596.0000	8206.0000	12.6809	13.7916	3.7137	3.7539	3.0000	23.0000
POS &PRE	47	980.0000	22266.0000	20.8511	38.9778	6.2432	6.3107	12.0000	41.0000
POS ONLY	7	127.0000	2467.0000	18.1429	23.2653	4.8234	5.2099	12.0000	28.0000

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	22	312.0000	4702.0000	14.1818	12.6033	3.5501	3.6337	8.0000	22.0000
PRE &POS	33	450.0000	6582.0000	13.6364	13.5041	3.6748	3.7318	8.0000	21.0000
POS &PRE	33	610.0000	12304.0000	18.4848	31.1589	5.5820	5.6686	9.0000	33.0000
POS ONLY	5	97.0000	1855.0000	19.4000	2.6400	1.6248	1.8166	17.0000	21.0000

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	33	458.0000	7040.0000	13.8788	20.7126	4.5511	4.6217	5.0000	24.0000
PRE &POS	80	1046.0000	14788.0000	13.0750	13.8944	3.7275	3.7510	3.0000	23.0000
POS &PRE	80	1590.0000	34570.0000	19.8750	37.1094	6.0917	6.1302	9.0000	41.0000
POS ONLY	12	224.0000	4362.0000	18.6667	15.0556	3.8801	4.0527	12.0000	28.0000

Table 5.2 .1h

Chemistry
Spring 1976

College II

CHEMISTRY PRETEST (331)
ATOMIC STRUCTURE AND BONDING (121) - (362)

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	12	131.0000	1685.0000	10.9167	21.2431	4.6090	4.8140	3.0000	18.0000
PR2 ONLY	12	84.0000	710.0000	7.0000	10.1667	3.1885	3.3303	2.0000	13.0000
PR1 &POS	34	378.0000	4776.0000	11.1176	16.8685	4.1071	4.1689	5.0000	22.0000
PR2 &POS	34	219.0000	1637.0000	6.4412	6.6583	2.5804	2.6192	1.0000	14.0000
POS &PRE	34	385.0000	4907.0000	11.3235	16.1012	4.0126	4.0730	3.0000	19.0000
POS ONLY	9	107.0000	1485.0000	11.8889	23.6543	4.8636	5.1586	5.0000	18.0000

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	9	92.0000	1060.0000	10.2222	13.2840	3.6447	3.8658	5.0000	17.0000
PR2 ONLY	9	42.0000	290.0000	4.6667	10.4444	3.2318	3.4278	1.0000	11.0000
PR1 &POS	13	127.0000	1453.0000	9.7692	16.3314	4.0412	4.2062	3.0000	18.0000
PR2 &POS	13	63.0000	399.0000	4.8462	7.2071	2.6846	2.7942	1.0000	10.0000
POS &PRE	13	164.0000	2274.0000	12.6154	15.7751	3.9718	4.1340	4.0000	19.0000
POS ONLY	4	50.0000	716.0000	12.5000	22.7500	4.7697	5.5076	7.0000	19.0000

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	21	223.0000	2745.0000	10.6190	17.9501	4.2368	4.3414	3.0000	18.0000
PR2 ONLY	21	126.0000	1000.0000	6.0000	11.6190	3.4087	3.4928	1.0000	13.0000
PR1 &POS	47	505.0000	6229.0000	10.7447	17.0837	4.1332	4.1779	3.0000	22.0000
PR2 &POS	47	282.0000	2036.0000	6.0000	7.3191	2.7054	2.7346	1.0000	14.0000
POS &PRE	47	549.0000	7181.0000	11.6809	16.3450	4.0429	4.0866	3.0000	19.0000
POS ONLY	13	157.0000	2201.0000	12.0769	23.4556	4.8431	5.0409	5.0000	19.0000

Table 5.2.1h (cont.)

CHEMISTRY PRETEST (331)
NOMENCLATURE - (363)

College II

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	20	215.0000	2613.0000	10.7500	15.0875	3.8843	3.9852	3.0000	18.0000
PR2 ONLY	20	129.0000	1031.0000	6.4500	9.9475	3.1540	3.2359	1.0000	13.0000
PR1 &POS	26	294.0000	3848.0000	11.3077	20.1361	4.4873	4.5762	5.0000	22.0000
PR2 &POS	26	174.0000	1316.0000	6.6923	5.8284	2.4142	2.4620	3.0000	14.0000
POS &PRE	26	358.0000	5598.0000	13.7692	25.7160	5.0711	5.1715	3.0000	23.0000
POS ONLY	9	116.0000	1742.0000	12.8889	27.4321	5.2376	5.5553	5.0000	20.0000

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	10	94.0000	952.0000	9.4000	6.8400	2.6153	2.7568	5.0000	14.0000
PR2 ONLY	10	39.0000	201.0000	3.9000	4.8900	2.2113	2.3310	1.0000	9.0000
PR1 &POS	12	125.0000	1561.0000	10.4167	21.5764	4.6450	4.8516	3.0000	18.0000
PR2 &POS	12	66.0000	488.0000	5.5000	10.4167	3.2275	3.3710	1.0000	11.0000
POS &PRE	12	145.0000	2015.0000	12.0833	21.9097	4.6808	4.8889	5.0000	20.0000
POS ONLY	2	31.0000	485.0000	15.5000	2.2500	1.5000	2.1213	14.0000	17.0000

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PR1 ONLY	30	309.0000	3565.0000	10.3000	12.7433	3.5698	3.6308	3.0000	18.0000
PR2 ONLY	30	168.0000	1232.0000	5.6000	9.7067	3.1156	3.1688	1.0000	13.0000
PR1 &POS	38	419.0000	5409.0000	11.0263	20.7625	4.5566	4.6177	3.0000	22.0000
PR2 &POS	38	240.0000	1804.0000	6.3158	7.5845	2.7540	2.7910	1.0000	14.0000
POS &PRE	38	503.0000	7613.0000	13.2368	25.1281	5.0128	5.0801	3.0000	23.0000
POS ONLY	11	147.0000	2227.0000	13.3636	23.8678	4.8855	5.1239	5.0000	20.0000

Table 5.2.11

English
Spring 1976

College I

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ENGLISH PRETEST (531)
ENGLISH POSTTEST (591), ENGLISH 100 CLASSES

                    ALL PLATO CLASSES

                N       SUM         SUM**2       MEAN       VAR(N)     SD(N)     SD(N-1)      LOW         HIGH

PRE ONLY       37     606.0000   11670.0000   16.3784     52.5595    7.2498    7.3498     2.0000     30.0000
PRE &POS       37     651.0000   13233.0000   17.5946     46.0789    6.9339    7.0295     3.0000     30.0000
POS &PRE       37     689.0000   14319.0000   18.6216     45.6406    6.7558    6.8490     7.0000     35.0000
POS ONLY        3      50.0000     874.0000   16.6667     13.5556    3.6818    4.5092    12.0000     21.0000



                    ALL NON PLATO CLASSES

                N       SUM         SUM**2       MEAN       VAR(N)     SD(N)     SD(N-1)      LOW         HIGH

PRE ONLY       43     653.0000   12701.0000   15.1860     64.7561    8.0471    8.1424     2.0000     37.0000
PRE &POS       29     429.0000    7721.0000   14.7931     47.4055    6.8852    7.0070     1.0000     27.0000
POS &PRE       29     460.0000    8174.0000   15.8621     30.2568    5.5006    5.5980     4.0000     25.0000
POS ONLY       18     263.0000    4395.0000   14.6111     30.6821    5.5391    5.6997     5.0000     24.0000



                    ALL CLASSES

                N       SUM         SUM**2       MEAN       VAR(N)     SD(N)     SD(N-1)      LOW         HIGH

PRE ONLY       80    1259.0000   24571.0000   15.7375     59.4686    7.7116    7.7602     2.0000     37.0000
PRE &POS       66    1080.0000   20954.0000   16.3636     49.7163    7.0510    7.1050     1.0000     30.0000
POS &PRE       66    1149.0000   22693.0000   17.4091     40.7569    6.3841    6.4330     4.0000     35.0000
POS ONLY       21     313.0000    5269.0000   14.9048     28.7528    5.3622    5.4946     5.0000     24.0000
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Table 5.2.11 (cont.)

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ENGLISH PRETEST (531)
ENGLISH POSTTEST (591), ENGLISH 100 CLASSES
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College III

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                    ALL PLATO CLASSES

             N      SUM          SUM**2        MEAN       VAR(N)      SD(N)     SD(N-1)      LOW        HIGH

PRE ONLY     9    213.0000     5751.0000     23.6667     76.8869     8.8819     9.4207    11.0000     38.0000
PRE &POS    15    330.0000     7954.0000     22.0000     46.2667     6.8020     7.0407     8.0000     35.0000
POS &PRE    15    353.0000     8961.0000     23.5333     43.5822     6.6017     6.8334     7.0000     33.0000
POS ONLY     1     23.0000      529.0000     23.0000      0.0        0.0        0.0       23.0000     23.0000



                    ALL NON PLATO CLASSES

             N      SUM          SUM**2        MEAN       VAR(N)      SD(N)     SD(N-1)      LOW        HIGH

PRE ONLY     9    179.0000     4033.0000     19.8889     52.5432     7.2487     7.6884     3.0000     28.0000
PRE &POS    10    211.0000     4797.0000     21.1000     34.4900     5.8728     6.1905    11.0000     33.0000
POS &PRE    10    218.0000     4896.0000     21.8000     14.3600     3.7895     3.9944    16.0000     31.0000
POS ONLY     1     17.0000      289.0000     17.0000      0.0        0.0        0.0       17.0000     17.0000



                    ALL CLASSES

             N      SUM          SUM**2        MEAN       VAR(N)      SD(N)     SD(N-1)      LOW        HIGH

PRE ONLY    18    392.0000     9784.0000     21.7778     69.2840     8.3237     8.5650     3.0000     38.0000
PRE &POS    25    541.0000    12751.0000     21.6400     41.7504     6.4615     6.5947     8.0000     35.0000
POS &PRE    25    571.0000    13857.0000     22.6400     32.6144     5.7109     5.8287     7.0000     33.0000
POS ONLY     2     40.0000      818.0000     20.0000      9.0000     3.0000     4.2426    17.0000     23.0000
```

Table 5.2.11 (cont.)

ENGLISH PRETEST (531)
ENGLISH POSTTEST (591), ENGLISH 101 CLASSES

College I

ALL PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	51	1027.0000	22919.0000	20.1373	43.8831	6.6244	6.6904	4.0000	33.0000
PRE &POS	72	1490.0000	34578.0000	20.6944	51.9900	7.2104	7.2610	6.0000	36.0000
POS &PRE	72	1750.0000	46504.0000	24.3056	55.1289	7.4249	7.4770	8.0000	37.0000
POS ONLY	6	162.0000	4774.0000	27.0000	66.6667	8.1650	8.9443	13.0000	38.0000

ALL NON PLATO CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	25	542.0000	13274.0000	21.6800	60.9376	7.8063	7.9672	8.0000	37.0000
PRE &POS	40	804.0000	19342.0000	20.1000	79.5400	8.9185	9.0321	4.0000	37.0000
POS &PRE	40	982.0000	26058.0000	24.5500	48.7475	6.9819	7.0709	11.0000	35.0000
POS ONLY	5	111.0000	2499.0000	22.2000	6.9600	2.6382	2.9496	18.0000	25.0000

ALL CLASSES

	N	SUM	SUM**2	MEAN	VAR(N)	SD(N)	SD(N-1)	LOW	HIGH
PRE ONLY	76	1569.0000	36193.0000	20.6447	50.0185	7.0724	7.1194	4.0000	37.0000
PRE &POS	112	2294.0000	53920.0000	20.4821	61.9104	7.8683	7.9037	4.0000	37.0000
POS &PRE	112	2732.0000	72562.0000	24.3929	52.8635	7.2707	7.3034	8.0000	37.0000
POS ONLY	11	273.0000	7273.0000	24.8182	45.2397	6.7260	7.0543	13.0000	38.0000

Table 5.2.11 (cont.)

College II

```
ENGLISH PRETEST (531)
ENGLISH POSTTEST (591), ENGLISH 101 CLASSES

                         ALL PLATO CLASSES

                  N       SUM         SUM**2        MEAN        VAR(N)      SD(N)     SD(N-1)       LOW        HIGH

PRE ONLY         23     352.0000     7074.0000    15.3043      73.3422     8.5640     8.7565      2.0000     33.0000
PRE &POS         20     281.0000     4859.0000    14.0500      45.5475     6.7489     6.9242      2.0000     28.0000
POS &PRE         20     315.0000     5743.0000    15.7500      39.0875     6.2520     6.4144      3.0000     26.0000
POS ONLY          6     125.0000     3537.0000    20.8333     155.4722    12.4689    13.6589      8.0000     40.0000


                         ALL NON PLATO CLASSES

                  N       SUM         SUM**2        MEAN        VAR(N)      SD(N)     SD(N-1)       LOW        HIGH

PRE ONLY         28     424.0000     7422.0000    15.1429      35.7653     5.9804     6.0902      4.0000     26.0000
PRE &POS         25     473.0000    11223.0000    18.9200      90.9536     9.5370     9.7336      3.0000     36.0000
POS &PRE         25     666.0000    19438.0000    26.6400      67.8304     8.2359     8.4058     13.0000     40.0000
POS ONLY          3      65.0000     1731.0000    21.6667     107.5556    10.3709    12.7017      7.0000     29.0000


                         ALL CLASSES

                . N       SUM         SUM**2        MEAN        VAR(N)      SD(N)     SD(N-1)       LOW        HIGH

PRE ONLY         51     776.0000    14456.0000    15.2157      52.7182     7.2607     7.3330      2.0000     33.0000
PRE &POS         45     754.0000    16082.0000    16.7556      76.6291     8.7538     8.8527      2.0000     36.0000
POS &PRE         45     981.0000    25181.0000    21.8000      84.3378     9.1836     9.2873      3.0000     40.0000
POS ONLY          9     190.0000     5268.0000    21.1111     139.6543    11.8175    12.5344      7.0000     40.0000
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Table 5.2.11 (cont.)

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ENGLISH PRETEST (531)
ENGLISH POSTTEST (591), ENGLISH 101 CLASSES
                                                          College III
                              ALL PLATO CLASSES

                     N        SUM          SUM**2         MEAN         VAR(N)       SD(N)       SD(N-1)       LOW          HIGH

PRE ONLY            10      301.0000     9307.0000      30.1000      24.6900      4.9689       5.2377      22.0000      35.0000
PRE &POS             8      248.0000     7826.0000      31.0000      17.2500      4.1533       4.4401      24.0000      38.0000
POS &PRE             8      248.0000     7818.0000      31.0000      16.2500      4.0311       4.3095      26.0000      37.0000
POS ONLY             0        0.0          0.0          0.0           0.0        0.0          0.0          0.0          0.0


                              ALL NON PLATO CLASSES

                     N        SUM          SUM**2         MEAN         VAR(N)       SD(N)       SD(N-1)       LOW          HIGH

PRE ONLY             5      149.0000     4479.0000      29.8000       7.7600      2.7857       3.1145      26.0000      33.0000
PRE &POS            14      351.0000     9235.0000      25.0714      31.0663      5.5737       5.7841      13.0000      34.0000
POS &PRE            14      358.0000     9800.0000      25.5714      46.1020      6.7898       7.0462      13.0000      37.0000
POS ONLY             4      114.0000     3284.0000      28.5000       8.7500      2.9580       3.4157      24.0000      32.0000


                              ALL CLASSES

                     N        SUM          SUM**2         MEAN         VAR(N)       SD(N)       SD(N-1)       LOW          HIGH

PRE ONLY            15      450.0000    13786.0000      30.0000      19.0667      4.3665       4.5198      22.0000      35.0000
PRE &POS            22      599.0000    17061.0000      27.2273      34.1756      5.8460       5.9836      13.0000      38.0000
POS &PRE            22      606.0000    17618.0000      27.5455      42.0661      6.4858       6.6385      13.0000      37.0000
POS ONLY             4      114.0000     3284.0000      28.5000       8.7500      2.9580       3.4157      24.0000      32.0000
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Table 5.2.1j

Mathematics
Spring 1976

College I

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MATHEMATICS PRETEST (431)
MATHEMATICS 111 TEST - (491)

                         ALL PLATO CLASSES

                 N         SUM         SUM**2        MEAN        VAR(N)       SD(N)      SD(N-1)       LOW         HIGH

PRE ONLY        18      406.0000     9698.0000     22.5556      41.1358      6.4137      6.5997      11.0000     32.0000
PRE &POS        27      719.0000    21973.0000     26.6296     104.6776     10.2312     10.4261      11.0000     60.0000
POS &PRE        27      433.0000     7715.0000     16.0370      28.5542      5.3436      5.4454       6.0000     32.0000
PCS ONLY         5       77.0000     1235.0000     15.4000       9.8400      3.1369      3.5071      11.0000     20.0000


                         ALL NON PLATO CLASSES

                 N         SUM         SUM**2        MEAN        VAR(N)       SD(N)      SD(N-1)       LOW         HIGH

PRE ONLY        28      690.0000    19400.0000     24.6429      85.5867      9.2513      9.4211      10.0000     48.0000
PRE &POS        26      767.0000    23863.0000     29.5000      47.5577      6.8962      7.0328      12.0000     46.0000
POS &PRE        26      489.0000     9967.0000     18.8077      29.6169      5.4421      5.5499       8.0000     29.0000
PCS ONLY         6      110.0000     2260.0000     18.3333      43.8889      6.6249      7.2572      11.0000     28.0000


                         ALL CLASSES

                 N         SUM         SUM**2        MEAN        VAR(N)       SD(N)      SD(N-1)       LOW         HIGH

PRE ONLY        46     1096.0000    29298.0000     23.8261      69.2306      8.3205      8.4124      10.0000     48.0000
PRE &POS        53     1486.0000    45836.0000     28.0377      78.7156      8.8722      8.9571      11.0000     60.0000
PCS &PRE        53      922.0000    17682.0000     17.3962      30.9939      5.5672      5.6205       8.0000     32.0000
PCS ONLY        11      187.0000     3515.0000     17.0000      30.5455      5.5268      5.7966      11.0000     28.0000
```

Table 6.2.3a

STUDENT SURVEY FALL 1975 (COMMON ITEMS)
RESPONSES GROUPED BY COLLEGE AND TREATMENT

	I-PL		I-N PL		II-PL		II-N PL		III-PL		III-N PL		IV-PL		IV-N PL	
TOTAL OBS.	352		274		172		136		250		183		105		86	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
1 I FELT CHALLENGED TO DO MY BEST WORK																
AGREE	312	91.23	241	89.59	153	91.62	119	88.81	196	79.35	153	84.07	83	79.81	69	81.18
DISAGREE	30	8.77	28	10.41	14	8.38	15	11.19	51	20.65	29	15.93	21	20.19	16	18.82
OTHER	10		5		5		2		3		1		1		1	
2 THERE WAS REAL CONCERN FOR MY PROGRESS IN COURSE																
AGREE	312	90.17	241	89.93	152	90.48	124	91.18	189	76.52	153	83.61	82	78.85	72	85.71
DISAGREE	34	9.83	27	10.07	16	9.52	12	8.82	58	23.48	30	16.39	22	21.15	12	14.29
OTHER	6		6		4		0		3		0		1		2	
3 I TRIED TO JUST FINISH ASSIGNMENTS RATHER THAN LEARN																
AGREE	35	10.14	28	10.37	18	10.53	13	9.70	46	18.47	23	12.64	15	14.29	15	17.86
DISAGREE	310	89.86	242	89.63	153	89.47	121	90.30	203	81.53	159	87.36	90	85.71	69	82.14
OTHER	7		4		1		2		1		1		0		2	
4 I DID NOT RECEIVE ANY INDIVIDUAL ATTENTION																
AGREE	80	23.67	77	28.21	38	23.17	30	22.73	73	29.55	48	26.52	14	13.33	13	15.48
DISAGREE	258	76.33	196	71.79	126	76.83	102	77.27	174	70.45	133	73.48	91	86.67	71	84.52
OTHER	14		1		8		4		3		2		0		2	
5 I OFTEN MET WITH INSTRUCTOR OUTSIDE CLASS TIME																
AGREE	102	29.74	81	30.34	57	34.13	47	35.34	58	23.48	40	22.10	38	36.54	31	36.90
DISAGREE	241	70.26	186	69.66	110	65.87	86	64.66	189	76.52	141	77.90	66	63.46	53	63.10
OTHER	9		7		5		3		3		2		1		2	
6 I FELT FREE TO ASK QUESTIONS OR EXPRESS OPINION																
AGREE	318	92.71	256	94.12	148	89.70	127	93.38	223	89.56	159	87.85	88	83.81	72	84.71
DISAGREE	25	7.29	16	5.88	17	10.30	9	6.62	26	10.44	22	12.15	17	16.19	13	15.29
OTHER	9		2		7		0		1		2		0		1	
7 I WOULD NOT RECOMMEND THIS COURSE TO MY FRIENDS																
AGREE	34	9.83	31	11.48	22	12.94	17	12.59	37	14.92	36	19.78	23	21.90	20	24.10
DISAGREE	312	90.17	239	88.52	148	87.06	118	87.41	211	85.08	146	80.22	82	78.10	63	75.90
OTHER	6		4		2		1		2		1		0		3	

(CONTINUED)

Table 6.2.3a (con't)

STUDENT SURVEY FALL 1975 (COMMON ITEMS)
RESPONSES GROUPED BY COLLEGE AND TREATMENT

	I-PL		I-N PL		II-PL		II-N PL		III-PL		III-N PL		IV-PL		IV-N PL	
TOTAL OBS.	352		274		172		136		250		183		105		85	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
8 MOST OF WORK IN THIS COURSE WAS TOO HARD																
AGREE	61	18.10	43	16.10	43	25.75	16	11.85	29	11.74	17	9.39	20	19.23	14	16.67
DISAGREE	276	81.90	224	83.90	124	74.25	119	88.15	218	88.26	164	90.61	84	80.77	70	83.33
OTHER	15		7		5		1		3		2		1		2	
9 I OFTEN DISCUSSED COURSE MATERIAL WITH OTHER STUDENTS																
AGREE	289	83.53	227	83.15	133	78.24	108	80.00	178	71.49	131	71.98	73	70.19	62	72.94
DISAGREE	57	16.47	46	16.85	37	21.76	27	20.00	71	28.51	51	28.02	31	29.81	23	27.06
OTHER	6		1		2		1		1		1		1		1	
10 DIFFICULT TO GET HELP WHEN I DIDN'T UNDERSTAND MATERIAL																
AGREE	43	12.46	26	9.59	25	14.71	10	7.41	32	12.85	20	11.05	10	9.52	9	10.71
DISAGREE	302	87.54	245	90.41	145	85.29	125	92.59	217	87.15	161	88.95	95	90.48	75	89.29
OTHER	7		3		2		1		1		2		0		2	
11 COMPUTERS WOULD HELP FIT INSTRUCTION TO MY NEEDS																
AGREE	256	74.64	103	40.71	113	67.66	56	44.09	180	73.17	76	43.43	67	64.42	37	48.05
DISAGREE	87	25.36	150	59.29	54	32.34	71	55.91	66	26.83	99	56.57	37	35.58	40	51.95
OTHER	9		21		5		9		4		8		1		9	
12 COMPUTERS WOULD MAKE ME ACTIVELY INVOLVED IN OWN LEARNING																
AGREE	269	79.59	107	42.29	127	74.71	61	48.41	193	78.14	84	46.93	69	65.71	47	60.26
DISAGREE	69	20.41	146	57.71	43	25.29	65	51.59	54	21.86	95	53.07	36	34.29	31	39.74
OTHER	14		21		2		10		3		4		0		8	
13 COMPUTERS NOT GOOD FOR INSTRUCTION BECAUSE BREAK DOWN																
AGREE	69	20.06	99	39.13	38	23.17	37	29.13	47	18.95	46	25.99	9	8.57	11	14.47
DISAGREE	275	79.94	154	60.87	126	76.83	90	70.87	201	81.05	131	74.01	96	91.43	65	85.53
OTHER	8		21		8		9		2		6		0		10	
14 COMPUTERS TOO IMPERSONAL FOR STUDENT INSTRUCTION																
AGREE	82	23.91	141	54.44	57	34.55	64	49.61	63	25.61	97	55.11	32	30.77	33	41.77
DISAGREE	261	76.09	118	45.56	108	65.45	65	50.39	183	74.39	79	44.89	72	69.23	46	58.23
OTHER	9		15		7		7		4		7		1		7	
15 COMPUTERS ALLOW ME TO SET PACE RIGHT FOR MY ABILITY																
AGREE	279	81.58	145	57.09	128	76.19	87	67.97	213	85.89	122	70.93	87	83.65	60	80.00
DISAGREE	63	18.42	109	42.91	40	23.81	41	32.03	35	14.11	50	29.07	17	16.35	15	20.00
OTHER	10		20		4		8		2		11		1		11	
16 COMPUTERS NOTHING BUT BABYSITTERS FOR THE TEACHER																
AGREE	39	11.34	75	29.76	23	14.02	37	28.91	24	9.72	51	28.98	12	11.43	16	20.25
DISAGREE	305	88.66	177	70.24	141	85.98	91	71.09	223	90.28	125	71.02	93	88.57	63	79.75
OTHER	8		22		8		8		3		7		0		7	

(CONTINUED)

Table 6.2.3a (con't)

STUDENT SURVEY FALL 1975 (COMMON ITEMS)
RESPONSES GROUPED BY COLLEGE AND TREATMENT

	I-PL		I-N PL		II-PL		II-N PL		III-PL		III-N PL		IV-PL		IV-N PL	
TOTAL OBS.	352		274		172		136		250		183		105		86	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
17 COMPUTERS ALLOW STUDENTS GREATER RESPONSIBILITY OWN LEARNING																
AGREE	299	86.92	183	71.21	136	80.47	95	74.80	219	87.60	128	71.51	85	81.73	68	87.18
DISAGREE	45	13.08	74	28.79	33	19.53	32	25.20	31	12.40	51	28.49	19	18.27	10	12.82
OTHER	8		17		3		9		0		4		1		8	
18 MECHANICS OF COMPUTER TERMINAL DISTRACT ME FROM LEARNING																
AGREE	40	11.66	82	32.16	31	18.45	29	22.31	29	11.74	60	33.52	16	15.53	20	25.32
DISAGREE	303	88.34	173	67.84	137	81.55	101	77.69	218	88.26	119	66.48	87	84.47	59	74.68
OTHER	9		19		4		6		3		4		2		7	
19 WOULD FEEL COMFORTABLE WORKING WITH COMPUTERS																
AGREE	279	82.30	142	55.04	114	69.51	73	57.48	203	82.86	101	56.74	79	75.24	51	65.38
DISAGREE	60	17.70	116	44.96	50	30.49	54	42.52	42	17.14	77	43.26	26	24.76	27	34.62
OTHER	13		16		8		9		5		5		0		8	
20 I WOULD NEVER CHOOSE COURSE TAUGHT USING A COMPUTER																
AGREE	72	21.18	84	32.18	58	35.37	48	38.71	34	13.88	51	28.65	14	13.33	17	20.48
DISAGREE	268	78.82	177	67.82	106	64.63	76	61.29	211	86.12	127	71.35	91	86.67	66	79.52
OTHER	12		13		8		12		5		5		0		3	
21 COMPUTERS SHOULD BE MORE IMPORTANT IN EVERYDAY LIFE																
AGREE	179	52.96	100	38.91	65	40.37	49	38.58	124	50.82	83	46.89	45	43.69	34	43.59
DISAGREE	159	47.04	157	61.09	96	59.63	78	61.42	120	49.18	94	53.11	58	56.31	44	56.41
OTHER	14		17		11		9		6		6		2		8	
22 I LOOKED FORWARD TO ATTEND THIS COURSE MORE THAN OTHERS																
AGREE	173	50.88	168	62.22	83	50.61	80	61.07	127	52.05	83	46.11	37	35.24	30	36.14
DISAGREE	167	49.12	102	37.78	81	49.39	51	38.93	117	47.95	97	53.89	68	64.76	53	63.86
OTHER	12		4		8		5		6		3		0		3	
23 THIS COURSE WAS MORE CHALLENGING COMPARED TO OTHERS																
AGREE	242	70.76	192	71.38	123	74.10	96	73.85	145	59.18	101	55.80	62	59.62	49	59.04
DISAGREE	100	29.24	77	28.62	43	25.90	34	26.15	100	40.82	80	44.20	42	40.38	34	40.96
OTHER	10		5		6		6		5		2		1		3	
24 THIS COURSE REQUIRED MORE WORK THAN OTHERS																
AGREE	194	57.74	160	61.30	94	56.29	74	55.64	131	52.82	93	51.67	63	60.58	46	56.10
DISAGREE	142	42.26	101	38.70	73	43.71	59	44.36	117	47.18	87	48.33	41	39.42	36	43.90
OTHER	16		13		5		3		2		3		1		4	
25 HOURS/WEEK ON COURSE HOMEWORK OUTSIDE REGULAR CLASS TIME																
ONE	20	5.93	9	3.38	14	8.59	6	4.58	27	10.84	20	11.11	5	4.76	6	7.41
TWO	32	9.50	20	7.52	19	11.66	5	3.82	45	18.07	30	16.67	16	15.24	11	13.58
THREE	43	12.76	49	18.42	26	15.95	28	21.37	37	14.86	34	18.89	10	9.52	13	16.05
FOUR	62	18.40	58	21.80	19	11.66	29	22.14	49	19.68	42	23.33	35	33.33	11	13.58
FIVE	61	18.10	47	17.67	29	17.79	14	10.69	50	20.08	24	13.33	14	13.33	17	20.99
>5	119	35.31	83	31.20	56	34.36	49	37.40	41	16.47	30	16.67	25	23.81	23	28.40
OTHER	15		8		9		5		1		3		0		5	

Table 6.2.3b

STUDENT SURVEY FALL 1975 (COMMON ITEMS)
RESPONSES GROUPED BY SUBJECT AREA AND TREATMENT

	ACT-PL		ACT-N PL		BIO-PL		BIO-N PL		CHM-PL		CHM-N PL		MTH-PL		MTH-N PL		ENG-PL		ENG-N PL	
TOTAL OBS.	86		66		294		144		213		145		22		11		264		313	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
1 I FELT CHALLENGED TO DO MY BEST WORK																				
AGREE	73	84.88	60	90.91	251	88.07	126	89.36	177	85.51	126	88.11	19	86.36	8	72.73	224	86.15	262	84.79
DISAGREE	13	15.12	6	9.09	34	11.93	15	10.64	30	14.49	17	11.89	3	13.64	3	27.27	36	13.85	47	15.21
OTHER	0		0		9		3		6		2		0		0		4		4	
2 THERE WAS REAL CONCERN FOR MY PROGRESS IN COURSE																				
AGREE	67	78.82	59	89.39	251	86.85	129	91.49	169	81.64	131	90.97	17	77.27	8	72.73	231	88.17	263	85.11
DISAGREE	18	21.18	7	10.61	38	13.15	12	8.51	38	18.36	13	9.03	5	22.73	3	27.27	31	11.83	46	14.89
OTHER	1		0		5		3		6		1		0		0		2		4	
3 I TRIED TO JUST FINISH ASSIGNMENTS RATHER THAN LEARN																				
AGREE	13	15.12	2	3.03	39	13.54	11	7.69	25	11.85	18	12.68	1	4.55	2	18.18	36	13.69	46	14.94
DISAGREE	73	84.88	64	96.97	249	86.46	132	92.31	186	88.15	124	87.32	21	95.45	9	81.82	227	86.31	262	85.06
OTHER	0		0		6		1		2		3		0		0		1		5	
4 I DID NOT RECEIVE ANY INDIVIDUAL ATTENTION																				
AGREE	32	38.10	19	30.16	55	19.23	36	25.00	40	19.61	27	19.01	8	38.10	3	27.27	70	27.03	83	26.77
DISAGREE	52	61.90	44	69.84	231	80.77	108	75.00	164	80.39	115	80.99	13	61.90	8	72.73	189	72.97	227	73.23
OTHER	2		3		8		0		9		3		1		0		5		3	
5 I OFTEN MET WITH INSTRUCTOR OUTSIDE CLASS TIME																				
AGREE	18	21.43	12	18.46	82	28.57	42	29.79	76	36.71	56	39.44	5	22.73	3	27.27	74	28.35	86	28.10
DISAGREE	66	78.57	53	81.54	205	71.43	99	70.21	131	63.29	86	60.56	17	77.27	8	72.73	187	71.65	220	71.90
OTHER	2		1		7		3		6		3		0		0		3		7	
6 I FELT FREE TO ASK QUESTIONS OR EXPRESS OPINION																				
AGREE	81	95.29	63	96.92	268	93.71	140	97.90	173	83.57	124	85.52	19	86.36	10	90.91	236	90.08	277	89.35
DISAGREE	4	4.71	2	3.08	18	6.29	3	2.10	34	16.43	21	14.48	3	13.64	1	9.09	26	9.92	33	10.65
OTHER	1		1		8		1		6		0		0		0		2		3	
7 I WOULD NOT RECOMMEND THIS COURSE TO MY FRIENDS																				
AGREE	8	9.30	4	6.06	32	11.11	15	10.42	44	21.05	30	20.98	3	13.64	1	10.00	29	10.98	54	17.59
DISAGREE	78	90.70	62	93.94	256	88.89	129	89.58	165	78.95	113	79.02	19	86.36	9	90.00	235	89.02	253	82.41
OTHER	0		0		6		0		4		2		0		1		0		6	
8 MOST OF WORK IN THIS COURSE WAS TOO HARD																				
AGREE	7	8.33	9	13.85	62	21.99	24	16.78	65	31.25	33	23.40	1	4.55	3	27.27	18	6.95	21	6.84
DISAGREE	77	91.67	56	86.15	220	78.01	119	83.22	143	68.75	108	76.60	21	95.45	8	72.73	241	93.05	286	93.16
OTHER	2		1		12		1		5		4		0		0		5		6	
9 I OFTEN DISCUSSED COURSE MATERIAL WITH OTHER STUDENTS																				
AGREE	61	71.76	52	78.79	246	84.83	117	81.25	177	84.69	123	85.42	16	72.73	9	81.82	173	65.78	227	73.23
DISAGREE	24	28.24	14	21.21	44	15.17	27	18.75	32	15.31	21	14.58	6	27.27	2	18.18	90	34.22	83	26.77
OTHER	1		0		4		0		4		1		0		0		1		3	

(CONTINUED)

Table 6.2.3b (cont'd)

STUDENT SURVEY FALL 1975 (COMMON ITEMS)
RESPONSES GROUPED BY SUBJECT AREA AND TREATMENT

	ACT-PL		ACT-N PL		BIO-PL		BIO-N PL		CHM-PL		CHM-N PL		MTH-PL		MTH-N PL		ENG-PL		ENG-N PL	
TOTAL OBS.	86		66		294		144		213		145		22		11		264		313	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
10 DIFFICULT TO GET HELP WHEN I DIDN'T UNDERSTAND MATERIAL																				
AGREE	13	15.12	4	6.15	34	11.85	10	7.04	35	16.67	24	16.78	5	22.73	2	18.18	23	8.71	25	8.06
DISAGREE	73	84.88	61	93.85	253	88.15	132	92.96	175	83.33	119	83.22	17	77.27	9	81.82	241	91.29	285	91.94
OTHER	0		1		7		2		3		2		0		0		0		3	
11 COMPUTERS WOULD HELP FIT INSTRUCTION TO MY NEEDS																				
AGREE	71	84.52	29	46.77	196	68.77	51	36.96	142	68.27	67	50.00	17	77.27	7	77.78	190	72.80	118	40.83
DISAGREE	13	15.48	33	53.23	89	31.23	87	63.04	66	31.73	67	50.00	5	22.73	2	22.22	71	27.20	171	59.17
OTHER	2		4		9		6		5		11		0		2		3		24	
12 COMPUTERS WOULD MAKE ME ACTIVELY INVOLVED IN OWN LEARNING																				
AGREE	70	81.40	32	50.00	211	74.56	46	34.07	149	71.63	69	50.74	20	90.91	8	80.00	208	79.69	144	49.48
DISAGREE	16	18.60	32	50.00	72	25.44	89	65.93	59	28.37	67	49.26	2	9.09	2	20.00	53	20.31	147	50.52
OTHER	0		2		11		9		5		9		0		1		3		22	
13 COMPUTERS NOT GOOD FOR INSTRUCTION BECAUSE BREAK DOWN																				
AGREE	17	19.77	11	17.19	63	21.95	50	35.97	36	17.48	39	29.32	3	13.64	4	40.00	44	16.92	89	31.01
DISAGREE	69	80.23	53	82.81	224	78.05	89	64.03	170	82.52	94	70.68	19	86.36	6	60.00	216	83.08	198	68.99
OTHER	0		2		7		5		7		12		0		1		4		26	
14 COMPUTERS TOO IMPERSONAL FOR STUDENT INSTRUCTION																				
AGREE	21	25.00	34	52.31	86	30.07	79	56.83	60	29.13	64	47.41	6	27.27	7	63.64	61	23.46	151	51.54
DISAGREE	63	75.00	31	47.69	200	69.93	60	43.17	146	70.87	71	52.59	16	72.73	4	36.36	199	76.54	142	48.46
OTHER	2		1		8		5		7		10		0		0		4		20	
15 COMPUTERS ALLOW ME TO SET PACE RIGHT FOR MY ABILITY																				
AGREE	72	84.71	43	69.35	228	79.44	74	54.01	157	76.21	91	68.94	19	86.36	9	81.82	231	88.17	197	68.64
DISAGREE	13	15.29	19	30.65	59	20.56	63	45.99	49	23.79	41	31.06	3	13.64	2	18.18	31	11.83	90	31.36
OTHER	1		4		7		7		7		13		0		0		2		26	
16 COMPUTERS NOTHING BUT BABYSITTERS FOR THE TEACHER																				
AGREE	10	11.76	13	20.63	34	11.81	43	31.39	21	10.19	31	22.79	3	13.64	3	30.00	30	11.58	89	30.80
DISAGREE	75	88.24	50	79.37	254	88.19	94	68.61	185	89.81	105	77.21	19	86.36	7	70.00	229	88.42	200	69.20
OTHER	1		3		6		7		7		9		0		1		5		24	
17 COMPUTERS ALLOW STUDENTS GREATER RESPONSIBILITY OWN LEARNING																				
AGREE	80	93.02	52	81.25	241	83.39	95	68.84	166	79.43	96	70.59	22	100.00	8	72.73	230	88.12	223	76.37
DISAGREE	6	6.98	12	18.75	48	16.61	43	31.16	43	20.57	40	29.41	0	0.0	3	27.27	31	11.88	69	23.63
OTHER	0		2		5		6		4		9		0		0		3		21	
18 MECHANICS OF COMPUTER TERMINAL DISTRACT ME FROM LEARNING																				
AGREE	11	12.79	17	27.42	41	14.24	50	36.23	40	19.32	39	28.47	3	13.64	3	27.27	21	8.14	82	27.80
DISAGREE	75	87.21	45	72.58	247	85.76	88	63.77	167	80.68	98	71.53	19	86.36	8	72.73	237	91.86	213	72.20
OTHER	0		4		6		6		6		8		0		0		6		18	

(CONTINUED)

Table 6.2.3b (cont'd)

STUDENT SURVEY FALL 1975 (COMMON ITEMS)
RESPONSES GROUPED BY SUBJECT AREA AND TREATMENT

	ACT-PL		ACT-N PL		BIO-PL		BIO-N PL		CHM-PL		CHM-N PL		MTH-PL		MTH-N PL		ENG-PL		ENG-N PL	
TOTAL OBS.	86		66		294		144		213		145		22		11		264		313	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
19 WOULD FEEL COMFORTABLE WORKING WITH COMPUTERS																				
AGREE	73	86.90	39	60.94	226	79.02	71	50.71	147	72.77	79	58.52	19	86.36	8	72.73	210	81.08	170	58.42
DISAGREE	11	13.10	25	39.06	60	20.98	69	49.29	55	27.23	56	41.48	3	13.64	3	27.27	49	18.92	121	41.58
OTHER	2		2		8		4		11		10		0		0		5		22	
20 I WOULD NEVER CHOOSE COURSE TAUGHT USING A COMPUTER																				
AGREE	11	13.25	17	25.76	67	23.43	54	38.57	57	27.54	47	34.81	1	4.55	3	30.00	42	16.41	79	26.78
DISAGREE	72	86.75	49	74.24	219	76.57	86	61.43	150	72.46	88	65.19	21	95.45	7	70.00	214	83.59	216	73.22
OTHER	3		0		8		4		6		10		0		1		8		18	
21 COMPUTERS SHOULD BE MORE IMPORTANT IN EVERYDAY LIFE																				
AGREE	47	55.29	35	53.85	143	50.53	38	27.94	85	42.08	56	42.42	10	45.45	6	60.00	128	50.39	131	44.26
DISAGREE	38	44.71	30	46.15	140	49.47	98	72.06	117	57.92	76	57.58	12	54.55	4	40.00	126	49.61	165	55.74
OTHER	1		1		11		8		11		13		0		1		10		17	
22 I LOOKED FORWARD TO ATTEND THIS COURSE MORE THAN OTHERS																				
AGREE	48	57.83	44	67.69	148	51.75	101	70.63	101	49.27	70	50.36	11	50.00	3	27.27	112	43.58	143	46.73
DISAGREE	35	42.17	21	32.31	138	48.25	42	29.37	104	50.73	69	49.64	11	50.00	8	72.73	145	56.42	163	53.27
OTHER	3		1		8		1		8		6		0		0		7		7	
23 THIS COURSE WAS MORE CHALLENGING COMPARED TO OTHERS																				
AGREE	68	80.00	52	78.79	212	74.65	111	77.62	165	80.10	118	84.89	6	27.27	3	27.27	121	46.54	154	50.66
DISAGREE	17	20.00	14	21.21	72	25.35	32	22.38	41	19.90	21	15.11	16	72.73	8	72.73	139	53.46	150	49.34
OTHER	1		0		10		1		7		6		0		0		4		9	
24 THIS COURSE REQUIRED MORE WORK THAN OTHERS																				
AGREE	69	81.18	49	74.24	166	58.45	90	64.75	157	75.12	105	75.00	4	20.00	5	45.45	86	33.46	124	41.33
DISAGREE	16	18.82	17	25.76	118	41.55	49	35.25	52	24.88	35	25.00	16	80.00	6	54.55	171	66.54	176	58.67
OTHER	1		0		10		5		4		5		2		0		7		13	
25 HOURS/WEEK ON COURSE HOMEWORK OUTSIDE REGULAR CLASS TIME																				
ONE	3	3.53	3	4.62	15	5.21	8	5.67	13	6.28	3	2.17	1	4.76	0	0.0	34	13.44	27	8.91
TWO	8	9.41	4	6.15	40	13.89	14	9.93	18	8.70	6	4.35	3	14.29	2	18.18	43	17.00	40	13.20
THREE	10	11.76	10	15.38	42	14.58	24	17.02	20	9.66	24	17.39	4	19.05	2	18.18	40	15.81	64	21.12
FOUR	12	14.12	11	16.92	46	15.97	20	14.18	39	18.84	27	19.57	6	28.57	3	27.27	62	24.51	79	26.07
FIVE	15	17.65	13	20.00	63	21.88	27	19.15	35	16.91	23	16.67	3	14.29	3	27.27	38	15.02	36	11.88
>5	37	43.53	24	36.92	82	28.47	48	34.04	82	39.61	55	39.86	4	19.05	1	9.09	36	14.23	57	18.81
OTHER	1		1		6		3		6		7		1		0		11		10	

Table 6.2.3c

STUDENT SURVEY SPRING 1976 (COMMON ITEMS) COLLEGES I,II & III ONLY
RESPONSES GROUPED BY TREATMENT

	PLATO		NO PLATO		
NUMBER OF OBSERVATIONS	477		307		
ITEMS AND ALTERNATIVES	FREQ	PERCENT	FREQ	PERCENT	CHISQ
1 I FELT CHALLENGED TO DO MY BEST WORK					0.7682
1 AGREE	417	88.54	277	90.52	
2 DISAGREE	54	11.46	29	9.48	
TOTAL	471	98.74	306	99.67	
2 THERE WAS REAL CONCERN FOR MY PROGRESS IN COURSE					0.0210
1 AGREE	425	90.81	277	91.12	
2 DISAGREE	43	9.19	27	8.88	
TOTAL	468	98.11	304	99.02	
3 I TRIED TO JUST FINISH ASSIGNMENTS RATHER THAN LEARN					0.1879
1 AGREE	49	10.45	35	11.44	
2 DISAGREE	420	89.55	271	88.56	
TOTAL	469	98.32	306	99.67	
4 I DID NOT RECEIVE ANY INDIVIDUAL ATTENTION					1.9131
1 AGREE	94	20.04	73	24.25	
2 DISAGREE	375	79.96	228	75.75	
TOTAL	469	98.32	301	98.05	
5 I OFTEN MET WITH INSTRUCTOR OUTSIDE CLASS TIME					3.9121
1 AGREE	167	35.53	86	28.67	
2 DISAGREE	303	64.47	214	71.33	
TOTAL	470	98.53	300	97.72	
6 I FELT FREE TO ASK QUESTIONS OR EXPRESS OPINION					0.6469
1 AGREE	432	91.53	284	93.11	
2 DISAGREE	40	8.47	21	6.89	
TOTAL	472	98.95	305	99.35	
7 I WOULD NOT RECOMMEND THIS COURSE TO MY FRIENDS					1.5777
1 AGREE	70	14.80	35	11.63	
2 DISAGREE	403	85.20	266	88.37	
TOTAL	473	99.16	301	98.05	
8 MOST OF WORK IN THIS COURSE WAS TOO HARD					3.3441
1 AGREE	76	16.34	35	11.59	
2 DISAGREE	389	83.66	267	88.41	
TOTAL	465	97.48	302	98.37	
9 I OFTEN DISCUSSED COURSE MATERIAL WITH OTHER STUDENTS					1.0640
1 AGREE	376	79.83	234	76.72	
2 DISAGREE	95	20.17	71	23.28	
TOTAL	471	98.74	305	99.35	

(CONTINUED)

Table 6.2.3c (con't)

STUDENT SURVEY SPRING 1976 (COMMON ITEMS) COLLEGES I,II & III ONLY
RESPONSES GROUPED BY TREATMENT

ITEMS AND ALTERNATIVES		PLATO FREQ	PLATO PERCENT	NO PLATO FREQ	NO PLATO PERCENT	CHISQ
NUMBER OF OBSERVATIONS		477		307		
10	DIFFICULT TO GET HELP WHEN I DIDN'T UNDERSTAND MATERIAL					0.9317
1	AGREE	66	13.89	35	11.51	
2	DISAGREE	409	86.11	269	88.49	
	TOTAL	475	99.58	304	99.02	
11	COMPUTERS WOULD HELP FIT INSTRUCTION TO MY NEEDS					37.2442
1	AGREE	323	69.16	137	46.92	
2	DISAGREE	144	30.84	155	53.08	
	TOTAL	467	97.90	292	95.11	
12	COMPUTERS WOULD MAKE ME ACTIVELY INVOLVED IN OWN LEARNING					32.7027
1	AGREE	339	72.13	151	51.71	
2	DISAGREE	131	27.87	141	48.29	
	TOTAL	470	98.53	292	95.11	
13	COMPUTERS NOT GOOD FOR INSTRUCTION BECAUSE BREAK DOWN					25.4134
1	AGREE	71	15.20	90	30.51	
2	DISAGREE	396	84.80	205	69.49	
	TOTAL	467	97.90	295	96.09	
14	COMPUTERS TOO IMPERSONAL FOR STUDENT INSTRUCTION					15.1780
1	AGREE	126	26.98	121	40.47	
2	DISAGREE	341	73.02	178	59.53	
	TOTAL	467	97.90	299	97.39	
15	COMPUTERS ALLOW ME TO SET PACE RIGHT FOR MY ABILITY					29.1365
1	AGREE	378	80.77	187	63.18	
2	DISAGREE	90	19.23	109	36.82	
	TOTAL	468	98.11	296	96.42	
16	COMPUTERS NOTHING BUT BABYSITTERS FOR THE TEACHER					8.4174
1	AGREE	78	16.85	76	25.50	
2	DISAGREE	385	83.15	222	74.50	
	TOTAL	463	97.06	298	97.07	
17	COMPUTERS ALLOW STUDENTS GREATER RESPONSIBILITY OWN LEARNING					16.1118
1	AGREE	399	85.62	215	73.88	
2	DISAGREE	67	14.38	76	26.12	
	TOTAL	466	97.69	291	94.79	
18	MECHANICS OF COMPUTER TERMINAL DISTRACT ME FROM LEARNING					13.5487
1	AGREE	56	12.07	66	22.07	
2	DISAGREE	408	87.93	233	77.93	
	TOTAL	464	97.27	299	97.39	

(CONTINUED)

Table 6.2.3c (con't)

STUDENT SURVEY SPRING 1976 (COMMON ITEMS) COLLEGES I,II & III ONLY

RESPONSES GROUPED BY TREATMENT

		PLATO		NO PLATO		
NUMBER OF OBSERVATIONS		477		307		
ITEMS AND ALTERNATIVES		FREQ	PERCENT	FREQ	PERCENT	CHISQ
19	WOULD FEEL COMFORTABLE WORKING WITH COMPUTERS					19.0172
1	AGREE	371	79.96	192	65.75	
2	DISAGREE	93	20.04	100	34.25	
	TOTAL	464	97.27	292	95.11	
20	I WOULD NEVER CHOOSE COURSE TAUGHT USING A COMPUTER					2.9909
1	AGREE	98	20.94	77	26.37	
2	DISAGREE	370	79.06	215	73.63	
	TOTAL	468	98.11	292	95.11	
21	COMPUTERS SHOULD BE MORE IMPORTANT IN EVERYDAY LIFE					9.9618
1	AGREE	247	52.78	122	41.08	
2	DISAGREE	221	47.22	175	58.92	
	TOTAL	468	98.11	297	96.74	
22	I LOOKED FORWARD TO ATTEND THIS COURSE MORE THAN OTHERS					2.6853
1	AGREE	225	49.34	162	55.48	
2	DISAGREE	231	50.66	130	44.52	
	TOTAL	456	95.60	292	95.11	
23	THIS COURSE WAS MORE CHALLENGING COMPARED TO OTHERS					0.4990
1	AGREE	324	70.43	202	68.01	
2	DISAGREE	136	29.57	95	31.99	
	TOTAL	460	96.44	297	96.74	
24	THIS COURSE REQUIRED MORE WORK THAN OTHERS					2.3311
1	AGREE	265	57.73	152	52.05	
2	DISAGREE	194	42.27	140	47.95	
	TOTAL	459	96.23	292	95.11	
25	HOURS/WEEK ON COURSE HOMEWORK OUTSIDE REGULAR CLASS TIME					11.0473
1	ONE	27	5.82	21	7.02	
2	TWO	60	12.93	26	8.70	
3	THREE	87	18.75	56	18.73	
4	FOUR	89	19.18	81	27.09	
5	FIVE	81	17.46	38	12.71	
6	>5	120	25.86	77	25.75	
	TOTAL	464	97.27	299	97.39	

Table 6.2.3d

STUDENT SURVEY SPRING 1976 (COMMON ITEMS)
RESPONSES GROUPED BY COLLEGE AND TREATMENT

	I-PL		I-N PL		II-PL		II-N PL		III-PL		III-N PL		IV-PL		IV-N PL		V-PL		V-N PL	
TOTAL OBS.	252		160		107		67		118		80		39		0		163		0	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
1 I FELT CHALLENGED TO DO MY BEST WORK																				
AGREE	229	91.97	146	91.25	94	88.68	61	91.04	94	81.03	70	88.61	31	81.58	0	0.0	154	95.06	0	0.0
DISAGREE	20	8.03	14	8.75	12	11.32	6	8.96	22	18.97	9	11.39	7	18.42	0	0.0	8	4.94	0	0.0
OTHER	3		0		1		0		2		1		1		0		1		0	
2 THERE WAS REAL CONCERN FOR MY PROGRESS IN COURSE																				
AGREE	230	93.50	143	91.08	97	90.65	60	89.55	98	85.22	74	92.50	[illegible]	75.68	0	0.0	152	93.25	0	0.0
DISAGREE	16	6.50	14	8.92	10	9.35	7	10.45	17	14.78	6	7.50	9	24.32	0	0.0	11	6.75	0	0.0
OTHER	6		3		0		0		3		0		2		0		0		0	
3 I TRIED TO JUST FINISH ASSIGNMENTS RATHER THAN LEARN																				
AGREE	19	7.57	17	10.69	10	9.71	5	7.46	20	17.39	13	16.25	3	7.89	0	0.0	12	7.41	0	0.0
DISAGREE	232	92.43	142	89.31	93	90.29	62	92.54	95	82.61	67	83.75	35	92.11	0	0.0	150	92.59	0	0.0
OTHER	1		1		4		0		3		0		1		0		1		0	
4 I DID NOT RECEIVE ANY INDIVIDUAL ATTENTION																				
AGREE	56	22.58	49	31.21	20	18.87	14	21.54	18	15.65	10	12.66	7	18.42	0	0.0	29	18.35	0	0.0
DISAGREE	192	77.42	108	68.79	86	81.13	51	78.46	97	84.35	69	87.34	31	81.58	0	0.0	129	81.65	0	0.0
OTHER	4		3		1		2		3		1		1		0		5		0	
5 I OFTEN MET WITH INSTRUCTOR OUTSIDE CLASS TIME																				
AGREE	84	33.60	41	26.11	38	36.19	19	29.69	45	39.13	26	32.91	15	41.67	0	0.0	31	20.13	0	0.0
DISAGREE	166	66.40	116	73.89	67	63.81	45	70.31	70	60.87	53	67.09	21	58.33	0	0.0	123	79.87	0	0.0
OTHER	2		3		2		3		3		1		3		0		9		0	
6 I FELT FREE TO ASK QUESTIONS OR EXPRESS OPINION																				
AGREE	230	92.74	148	93.08	96	89.72	63	95.45	106	90.60	73	91.25	37	94.87	0	0.0	144	88.89	0	0.0
DISAGREE	18	7.26	11	6.92	11	10.28	3	4.55	11	9.40	7	8.75	2	5.13	0	0.0	18	11.11	0	0.0
OTHER	4		1		0		1		1		0		0		0		1		0	
7 I WOULD NOT RECOMMEND THIS COURSE TO MY FRIENDS																				
AGREE	31	12.35	19	12.10	15	14.02	4	6.15	24	20.87	12	15.19	7	18.42	0	0.0	16	9.88	0	0.0
DISAGREE	220	87.65	138	87.90	92	85.98	61	93.85	91	79.13	67	84.81	31	81.58	0	0.0	146	90.12	0	0.0
OTHER	1		3		0		2		3		1		1		0		1		0	
8 MOST OF WORK IN THIS COURSE WAS TOO HARD																				
AGREE	37	15.10	19	12.10	21	20.00	7	10.77	18	15.65	9	11.25	8	21.62	0	0.0	15	9.32	0	0.0
DISAGREE	208	84.90	138	87.90	84	80.00	58	89.23	97	84.35	71	88.75	29	78.38	0	0.0	146	90.68	0	0.0
OTHER	7		3		2		2		3		0		2		0		2		0	
9 I OFTEN DISCUSSED COURSE MATERIAL WITH OTHER STUDENTS																				
AGREE	202	81.12	130	81.25	90	84.11	53	80.30	84	73.04	51	64.56	31	79.49	0	0.0	118	72.84	0	0.0
DISAGREE	47	18.88	30	18.75	17	15.89	13	19.70	31	26.96	28	35.44	8	20.51	0	0.0	44	27.16	0	0.0
OTHER	3		0		0		1		3		1		0		0		1		0	

(CONTINUED)

Table 6.2.3d (con't)

STUDENT SURVEY SPRING 1976 (COMMON ITEMS)
RESPONSES GROUPED BY COLLEGE AND TREATMENT

	I-PL		I-N PL		II-PL		II-N PL		III-PL		III-N PL		IV-PL		IV-N PL		V-PL		V-N PL	
TOTAL OBS.	252		160		107		67		118		80		39		0		163		0	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
10 DIFFICULT TO GET HELP WHEN I DIDN'T UNDERSTAND MATERIAL																				
AGREE	42	16.73	21	13.13	8	7.48	7	10.77	16	13.68	7	8.86	3	7.89	0	0.0	20	12.42	0	0.0
DISAGREE	209	83.27	139	86.88	99	92.52	58	89.23	101	86.32	72	91.14	35	92.11	0	0.0	141	87.58	0	0.0
OTHER	1		0		0		2		1		1		1		0		2		0	
11 COMPUTERS WOULD HELP FIT INSTRUCTION TO MY NEEDS																				
AGREE	172	70.49	67	43.23	76	71.03	32	50.79	75	64.66	38	51.35	21	55.26	0	0.0	138	87.34	0	0.0
DISAGREE	72	29.51	88	56.77	31	28.97	31	49.21	41	35.34	36	48.65	17	44.74	0	0.0	20	12.66	0	0.0
OTHER	8		5		0		4		2		6		1		0		5		0	
12 COMPUTERS WOULD MAKE ME ACTIVELY INVOLVED IN OWN LEARNING																				
AGREE	185	74.30	81	53.29	69	64.49	33	50.77	85	74.56	37	49.33	21	55.26	0	0.0	142	89.31	0	0.0
DISAGREE	64	25.70	71	46.71	38	35.51	32	49.23	29	25.44	38	50.67	17	44.74	0	0.0	17	10.69	0	0.0
OTHER	3		8		0		2		4		5		1		0		4		0	
13 COMPUTERS NOT GOOD FOR INSTRUCTION BECAUSE BREAK DOWN																				
AGREE	39	15.85	61	39.35	17	16.04	18	28.13	15	13.04	11	14.47	3	7.89	0	0.0	14	8.92	0	0.0
DISAGREE	207	84.15	94	60.65	89	83.96	46	71.88	100	86.96	65	85.53	35	92.11	0	0.0	143	91.08	0	0.0
OTHER	6		5		1		3		3		4		1		0		6		0	
14 COMPUTERS TOO IMPERSONAL FOR STUDENT INSTRUCTION																				
AGREE	60	24.29	67	42.41	30	28.85	26	40.00	36	31.03	28	36.84	12	31.58	0	0.0	36	22.36	0	0.0
DISAGREE	187	75.71	91	57.59	74	71.15	39	60.00	80	68.97	48	63.16	26	68.42	0	0.0	125	77.64	0	0.0
OTHER	5		2		3		2		2		4		1		0		2		0	
15 COMPUTERS ALLOW ME TO SET PACE RIGHT FOR MY ABILITY																				
AGREE	202	81.12	92	58.60	78	76.47	45	69.23	98	83.76	50	67.57	25	64.10	0	0.0	143	89.94	0	0.0
DISAGREE	47	18.88	65	41.40	24	23.53	20	30.77	19	16.24	24	32.43	14	35.90	0	0.0	16	10.06	0	0.0
OTHER	3		3		5		2		1		6		0		0		4		0	
16 COMPUTERS NOTHING BUT BABYSITTERS FOR THE TEACHER																				
AGREE	45	18.26	43	27.74	18	17.65	19	28.79	20	17.39	14	18.18	3	7.89	0	0.0	23	14.47	0	0.0
DISAGREE	200	81.74	112	72.26	84	82.35	47	71.21	95	82.61	63	81.82	35	92.11	0	0.0	136	85.53	0	0.0
OTHER	6		5		5		1		3		3		1		0		4		0	
17 COMPUTERS ALLOW STUDENTS GREATER RESPONSIBILITY OWN LEARNING																				
AGREE	218	89.34	114	73.55	86	81.90	50	79.37	95	81.20	51	69.86	28	73.68	0	0.0	151	93.21	0	0.0
DISAGREE	26	10.66	41	26.45	19	18.10	13	20.63	22	18.80	22	30.14	10	26.32	0	0.0	11	6.79	0	0.0
OTHER	8		5		2		4		1		7		1		0		1		0	
18 MECHANICS OF COMPUTER TERMINAL DISTRACT ME FROM LEARNING																				
AGREE	25	10.00	38	24.05	12	12.12	11	16.92	19	16.52	17	22.37	14	35.90	0	0.0	15	9.38	0	0.0
DISAGREE	225	90.00	120	75.95	87	87.88	54	83.08	96	83.48	59	77.63	25	64.10	0	0.0	145	90.63	0	0.0
OTHER	2		2		8		2		3		4		0		0		3		0	

(CONTINUED)

Table 6.2.3d (con't)
STUDENT SURVEY SPRING 1976 (COMMON ITEMS)
RESPONSES GROUPED BY COLLEGE AND TREATMENT

	I-PL		I-N PL		II-PL		II-N PL		III-PL		III-N PL		IV-PL		IV-N PL		V-PL		V-N PL	
TOTAL OBS.	252		160		107		67		118		80		39		0		163		0	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
19 WOULD FEEL COMFORTABLE WORKING WITH COMPUTERS																				
AGREE	200	82.30	96	62.75	73	69.52	48	75.00	98	84.48	48	64.00	21	55.26	0	0.0	136	85.53	0	0.0
DISAGREE	43	17.70	57	37.25	32	30.48	16	25.00	18	15.52	27	36.00	17	44.74	0	0.0	23	14.47	0	0.0
OTHER	9		7		2		3		2		5		1		0		4		0	
20 I WOULD NEVER CHOOSE COURSE TAUGHT USING A COMPUTER																				
AGREE	42	17.00	42	27.63	26	24.76	16	25.00	30	25.86	19	25.00	12	31.58	0	0.0	24	15.29	0	0.0
DISAGREE	205	83.00	110	72.37	79	75.24	48	75.00	86	74.14	57	75.00	26	68.42	0	0.0	133	84.71	0	0.0
OTHER	5		8		2		3		2		4		1		0		6		0	
21 COMPUTERS SHOULD BE MORE IMPORTANT IN EVERYDAY LIFE																				
AGREE	137	55.02	66	42.04	48	45.71	24	36.92	62	54.39	32	42.67	13	37.14	0	0.0	119	74.84	0	0.0
DISAGREE	112	44.98	91	57.96	57	54.29	41	63.08	52	45.61	43	57.33	22	62.86	0	0.0	40	25.16	0	0.0
OTHER	3		3		2		2		4		5		4		0		4		0	
22 I LOOKED FORWARD TO ATTEND THIS COURSE MORE THAN OTHERS																				
AGREE	116	47.15	85	53.80	60	58.82	37	58.73	49	45.37	40	56.34	13	36.11	0	0.0	99	64.71	0	0.0
DISAGREE	130	52.85	73	46.20	42	41.18	26	41.27	59	54.63	31	43.66	23	63.89	0	0.0	54	35.29	0	0.0
OTHER	6		2		5		4		10		9		3		0		10		0	
23 THIS COURSE WAS MORE CHALLENGING COMPARED TO OTHERS																				
AGREE	170	69.11	110	70.06	82	79.61	39	59.09	72	64.86	53	71.62	29	78.38	0	0.0	111	69.38	0	0.0
DISAGREE	76	30.89	47	29.94	21	20.39	27	40.91	39	35.14	21	28.38	8	21.62	0	0.0	49	30.63	0	0.0
OTHER	6		3		4		1		7		6		2		0		3		0	
24 THIS COURSE REQUIRED MORE WORK THAN OTHERS																				
AGREE	132	53.44	91	58.71	73	70.87	22	34.92	60	55.05	39	52.70	26	68.42	0	0.0	64	40.25	0	0.0
DISAGREE	115	46.56	64	41.29	30	29.13	41	65.08	49	44.95	35	47.30	12	31.58	0	0.0	95	59.75	0	0.0
OTHER	5		5		4		4		9		6		1		0		4		0	
25 HOURS/WEEK ON COURSE HOMEWORK OUTSIDE REGULAR CLASS TIME																				
ONE	16	6.50	10	6.41	5	4.90	3	4.69	6	5.17	8	10.13	2	5.26	0	0.0	49	37.98	0	0.0
TWO	28	11.38	13	8.33	16	15.69	3	4.69	16	13.79	10	12.66	2	5.26	0	0.0	12	9.30	0	0.0
THREE	45	18.29	28	17.95	20	19.61	13	20.31	22	18.97	15	18.99	5	13.16	0	0.0	23	17.83	0	0.0
FOUR	41	16.67	38	24.36	18	17.65	19	29.69	30	25.86	24	30.38	9	23.68	0	0.0	16	12.40	0	0.0
FIVE	47	19.11	23	14.74	18	17.65	8	12.50	16	13.79	7	8.86	5	13.16	0	0.0	6	4.65	0	0.0
>5	69	28.05	44	28.21	25	24.51	18	28.13	26	22.41	15	18.99	15	39.47	0	0.0	23	17.83	0	0.0
OTHER	6		4		5		3		2		1		1		0		34		0	

Table 6.2.3e

STUDENT SURVEY SPRING 1976 (COMMON ITEMS) COLLEGES I,II & III ONLY
RESPONSES GROUPED BY SUBJECT AREA AND TREATMENT

	ACT-PL		ACT-N PL		BIO-PL		BIO-N PL		CHM-PL		CHM-N PL		MTH-PL		MTH-N PL		ENG-PL		ENG-N PL	
TOTAL OBS.	36		50		146		101		114		15		21		17		160		124	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
1 I FELT CHALLENGED TO DO MY BEST WORK																				
AGREE	31	88.57	48	97.96	125	86.81	89	88.12	98	87.50	15	100.00	21	100.00	15	88.24	142	89.31	110	88.71
DISAGREE	4	11.43	1	2.04	19	13.19	12	11.88	14	12.50	0	0.0	0	0.0	2	11.76	17	10.69	14	11.29
OTHER	1		1		2		0		2		0		0		0		1		0	
2 THERE WAS REAL CONCERN FOR MY PROGRESS IN COURSE																				
AGREE	26	76.47	47	94.00	127	88.81	90	90.91	104	92.04	12	80.00	17	89.47	15	88.24	151	94.97	113	91.87
DISAGREE	8	23.53	3	6.00	16	11.19	9	9.09	9	7.96	3	20.00	2	10.53	2	11.76	8	5.03	10	8.13
OTHER	2		0		3		2		1		0		2		0		1		1	
3 I TRIED TO JUST FINISH ASSIGNMENTS RATHER THAN LEARN																				
AGREE	6	17.65	4	8.00	18	12.41	11	10.89	11	10.09	0	0.0	1	4.76	3	17.65	13	8.13	17	13.82
DISAGREE	28	82.35	46	92.00	127	87.59	90	89.11	98	89.91	15	100.00	20	95.24	14	82.35	147	91.88	106	86.18
OTHER	2		0		1		0		5		0		0		0		0		1	
4 I DID NOT RECEIVE ANY INDIVIDUAL ATTENTION																				
AGREE	8	23.53	8	16.00	36	25.00	22	22.00	17	15.18	5	35.71	5	23.81	8	50.00	28	17.72	30	24.79
DISAGREE	26	76.47	42	84.00	108	75.00	78	78.00	95	84.82	9	64.29	16	76.19	8	50.00	130	82.28	91	75.21
OTHER	2		0		2		1		2		1		0		1		2		3	
5 I OFTEN MET WITH INSTRUCTOR OUTSIDE CLASS TIME																				
AGREE	5	14.29	15	30.61	52	36.11	23	23.00	53	47.75	6	50.00	2	9.52	3	17.65	55	34.59	39	31.97
DISAGREE	30	85.71	34	69.39	92	63.89	77	77.00	58	52.25	6	50.00	19	90.48	14	82.35	104	65.41	83	68.03
OTHER	1		1		2		1		3		3		0		0		1		2	
6 I FELT FREE TO ASK QUESTIONS OR EXPRESS OPINION																				
AGREE	31	88.57	44	88.00	127	88.19	94	93.07	103	90.35	12	85.71	20	95.24	16	94.12	151	95.57	118	95.93
DISAGREE	4	11.43	6	12.00	17	11.81	7	6.93	11	9.65	2	14.29	1	4.76	1	5.88	7	4.43	5	4.07
OTHER	1		0		2		0		0		1		0		0		2		1	
7 I WOULD NOT RECOMMEND THIS COURSE TO MY FRIENDS																				
AGREE	3	8.57	7	14.29	20	13.89	13	13.00	25	22.12	0	0.0	3	14.29	2	13.33	19	11.88	13	10.57
DISAGREE	32	91.43	42	85.71	124	86.11	87	87.00	88	77.88	14	100.00	18	85.71	13	86.67	141	88.13	110	89.43
OTHER	1		1		2		1		1		1		0		2		0		1	
8 MOST OF WORK IN THIS COURSE WAS TOO HARD																				
AGREE	6	17.14	10	20.00	29	20.57	11	11.22	31	28.18	4	28.57	4	20.00	3	17.65	6	3.77	7	5.69
DISAGREE	29	82.86	40	80.00	112	79.43	87	88.78	79	71.82	10	71.43	16	80.00	14	82.35	153	96.23	116	94.31
OTHER	1		0		5		3		4		1		1		0		1		1	
9 I OFTEN DISCUSSED COURSE MATERIAL WITH OTHER STUDENTS																				
AGREE	20	58.82	37	75.51	125	86.81	84	83.17	106	92.98	12	85.71	16	80.00	11	64.71	109	68.55	90	72.58
DISAGREE	14	41.18	12	24.49	19	13.19	17	16.83	8	7.02	2	14.29	4	20.00	6	35.29	50	31.45	34	27.42
OTHER	2		1		2		0		0		1		1		0		1		0	

(CONTINUED)

Table 6.2.3e (con't)

STUDENT SURVEY SPRING 1976 (COMMON ITEMS) COLLEGES I,II & III ONLY
RESPONSES GROUPED BY SUBJECT AREA AND TREATMENT

	ACT-PL		ACT-N PL		BIO-PL		BIO-N PL		CHM-PL		CHM-N PL		MTH-PL		MTH-N PL		ENG-PL		ENG-N PL	
TOTAL OBS.	36		50		146		101		114		15		21		17		160		124	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
10 DIFFICULT TO GET HELP WHEN I DIDN'T UNDERSTAND MATERIAL																				
AGREE	10	28.57	8	16.33	22	15.17	11	11.00	12	10.53	4	28.57	9	42.86	5	29.41	13	8.13	7	5.65
DISAGREE	25	71.43	41	83.67	123	84.83	89	89.00	102	89.47	10	71.43	12	57.14	12	70.59	147	91.88	117	94.35
OTHER	1		1		1		1		0		1		0		0		0		0	
11 COMPUTERS WOULD HELP FIT INSTRUCTION TO MY NEEDS																				
AGREE	17	48.57	24	53.33	99	70.21	48	48.98	84	74.34	6	50.00	12	60.00	10	58.82	111	70.25	49	40.83
DISAGREE	18	51.43	21	46.67	42	29.79	50	51.02	29	25.66	6	50.00	8	40.00	7	41.18	47	29.75	71	59.17
OTHER	1		5		5		3		1		3		1		0		2		4	
12 COMPUTERS WOULD MAKE ME ACTIVELY INVOLVED IN OWN LEARNING																				
AGREE	23	67.65	24	53.33	104	72.73	49	50.00	81	71.68	9	64.29	15	71.43	11	68.75	116	72.96	58	48.74
DISAGREE	11	32.35	21	46.67	39	27.27	49	50.00	32	28.32	5	35.71	6	28.57	5	31.25	43	27.04	61	51.26
OTHER	2		5		3		3		1		1		0		1		1		5	
13 COMPUTERS NOT GOOD FOR INSTRUCTION BECAUSE BREAK DOWN																				
AGREE	7	20.59	9	19.15	25	17.48	31	31.63	18	15.93	5	35.71	4	20.00	3	18.75	17	10.83	42	35.00
DISAGREE	27	79.41	38	80.85	118	82.52	67	68.37	95	84.07	9	64.29	16	80.00	13	81.25	140	89.17	78	65.00
OTHER	2		3		3		3		1		1		1		1		3		4	
14 COMPUTERS TOO IMPERSONAL FOR STUDENT INSTRUCTION																				
AGREE	17	48.57	19	39.58	39	27.46	39	39.39	33	29.46	6	42.86	5	23.81	7	41.18	32	20.38	50	41.32
DISAGREE	18	51.43	29	60.42	103	72.54	60	60.61	79	70.54	8	57.14	16	76.19	10	58.82	125	79.62	71	58.68
OTHER	1		2		4		2		2		1		0		0		3		3	
15 COMPUTERS ALLOW ME TO SET PACE RIGHT FOR MY ABILITY																				
AGREE	25	71.43	31	68.89	126	86.90	67	66.34	84	75.68	12	85.71	14	70.00	9	52.94	129	82.17	68	57.14
DISAGREE	10	28.57	14	31.11	19	13.10	34	33.66	27	24.32	2	14.29	6	30.00	8	47.06	28	17.83	51	42.86
OTHER	1		5		1		0		3		1		1		0		3		5	
16 COMPUTERS NOTHING BUT BABYSITTERS FOR THE TEACHER																				
AGREE	7	20.59	10	20.83	27	19.01	27	27.27	20	18.02	2	14.29	3	15.00	4	23.53	21	13.46	33	27.50
DISAGREE	27	79.41	38	79.17	115	80.99	72	72.73	91	81.98	12	85.71	17	85.00	13	76.47	135	86.54	87	72.50
OTHER	2		2		4		2		3		1		1		0		4		4	
17 COMPUTERS ALLOW STUDENTS GREATER RESPONSIBILITY OWN LEARNING																				
AGREE	25	71.43	32	72.73	130	89.66	80	80.81	94	83.93	8	61.54	19	90.48	12	70.59	131	85.62	83	70.34
DISAGREE	10	28.57	12	27.27	15	10.34	19	19.19	18	16.07	5	38.46	2	9.52	5	29.41	22	14.38	35	29.66
OTHER	1		6		1		2		2		2		0		0		7		6	
18 MECHANICS OF COMPUTER TERMINAL DISTRACT ME FROM LEARNING																				
AGREE	10	29.41	12	25.00	17	11.64	22	22.00	14	13.08	1	7.14	0	0.0	2	11.76	15	9.55	29	24.17
DISAGREE	24	70.59	36	75.00	129	88.36	78	78.00	93	86.92	13	92.86	20	100.00	15	88.24	142	90.45	91	75.83
OTHER	2		2		0		1		7		1		1		0		3		4	

(CONTINUED)

Table 6.2.3e (con't)

STUDENT SURVEY SPRING 1976 (COMMON ITEMS) COLLEGES I,II & III ONLY
RESPONSES GROUPED BY SUBJECT AREA AND TREATMENT

	ACT-PL		ACT-N PL		BIO-PL		BIO-N PL		CHM-PL		CHM-N PL		MTH-PL		MTH-N PL		ENG-PL		ENG-N PL	
TOTAL OBS.	36		50		146		101		114		15		21		17		160		124	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
19 WOULD FEEL COMFORTABLE WORKING WITH COMPUTERS																				
AGREE	27	77.14	28	59.57	118	82.52	71	72.45	82	72.57	9	64.29	16	80.00	14	82.35	128	83.66	70	60.34
DISAGREE	8	22.86	19	40.43	25	17.48	27	27.55	31	27.43	5	35.71	4	20.00	3	17.65	25	16.34	46	39.66
OTHER	1		3		3		3		1		1		1		0		7		8	
20 I WOULD NEVER CHOOSE COURSE TAUGHT USING A COMPUTER																				
AGREE	9	25.71	12	25.00	27	18.75	28	28.28	31	27.43	3	21.43	2	10.53	4	25.00	29	18.47	30	26.09
DISAGREE	26	74.29	36	75.00	117	81.25	71	71.72	82	72.57	11	78.57	17	89.47	12	75.00	128	81.53	85	73.91
OTHER	1		2		2		2		1		1		2		1		3		9	
21 COMPUTERS SHOULD BE MORE IMPORTANT IN EVERYDAY LIFE																				
AGREE	19	54.29	19	41.30	78	54.93	41	41.41	57	50.89	6	40.00	11	52.38	8	47.06	82	51.90	48	40.00
DISAGREE	16	45.71	27	58.70	64	45.07	58	58.59	55	49.11	9	60.00	10	47.62	9	52.94	76	48.10	72	60.00
OTHER	1		4		4		2		2		0		0		0		2		4	
22 I LOOKED FORWARD TO ATTEND THIS COURSE MORE THAN OTHERS																				
AGREE	11	33.33	20	48.78	63	44.37	61	61.00	64	59.26	8	61.54	8	40.00	6	35.29	79	51.63	67	55.37
DISAGREE	22	66.67	21	51.22	79	55.63	39	39.00	44	40.74	5	38.46	12	60.00	11	64.71	74	48.37	54	44.63
OTHER	3		9		4		1		6		2		1		0		7		3	
23 THIS COURSE WAS MORE CHALLENGING COMPARED TO OTHERS																				
AGREE	25	75.76	39	86.67	101	71.13	72	72.00	92	83.64	14	100.00	15	75.00	9	56.25	91	58.71	68	55.74
DISAGREE	8	24.24	6	13.33	41	28.87	28	28.00	18	16.36	0	0.0	5	25.00	7	43.75	64	41.29	54	44.26
OTHER	3		5		4		1		4		1		1		1		5		2	
24 THIS COURSE REQUIRED MORE WORK THAN OTHERS																				
AGREE	22	66.67	31	70.45	93	65.03	52	54.17	91	84.26	11	84.62	6	30.00	9	52.94	53	34.19	49	40.16
DISAGREE	11	33.33	13	29.55	50	34.97	44	45.83	17	15.74	2	15.38	14	70.00	8	47.06	102	65.81	73	59.84
OTHER	3		6		3		5		6		2		1		0		5		2	
25 HOURS/WEEK ON COURSE HOMEWORK OUTSIDE REGULAR CLASS TIME																				
ONE	0	0.0	4	8.00	9	6.21	6	6.00	4	3.67	0	0.0	0	0.0	3	18.75	14	9.09	8	6.72
TWO	3	8.57	5	10.00	17	11.72	9	9.00	12	11.01	0	0.0	3	14.29	3	18.75	25	16.23	9	7.56
THREE	11	31.43	8	16.00	24	16.55	19	19.00	17	15.60	2	14.29	3	14.29	2	12.50	32	20.78	25	21.01
FOUR	7	20.00	12	24.00	33	22.76	28	28.00	15	13.76	4	28.57	5	23.81	4	25.00	29	18.83	33	27.73
FIVE	4	11.43	6	12.00	24	16.55	12	12.00	21	19.27	2	14.29	6	28.57	2	12.50	26	16.88	16	13.45
>5	10	28.57	15	30.00	38	26.21	26	26.00	40	36.70	6	42.86	4	19.05	2	12.50	28	18.18	28	23.53
OTHER	1		0		1		1		5		1		0		1		6		5	

Table 6.3.1a

STUDENT SURVEY FALL 1975 (ITEMS UNIQUE TO PLATO)

	I - PL		II - PL		III - PL		IV - PL		ACT - PL		BIO - PL		CHM - PL		MTH - PL		ENG - PL		TOT - PL	
TOTAL OBS.	352		172		250		105		86		294		213		22		264		879	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
26 IN THIS COURSE, I USED PLATO FOR PART OF MY INSTRUCTION																				
AGREE	327	97.32	121	90.98	190	97.44	99	98.02	80	95.24	234	96.69	185	94.87	22	100.00	216	97.30	737	96.34
DISAGREE	9	2.68	12	9.02	5	2.56	2	1.98	4	4.76	8	3.31	10	5.13	0	0.0	6	2.70	28	3.66
OTHER	16		39		55		4		2		52		18		0		42		114	
27 PLATO COURSE MATERIAL HELPED ME LEARN BETTER THAN LECTURE																				
AGREE	162	49.85	50	37.88	95	49.22	59	60.20	34	42.50	109	45.61	77	40.31	9	42.86	137	63.13	366	48.93
DISAGREE	163	50.15	82	62.12	98	50.78	39	39.80	46	57.50	130	54.39	114	59.69	12	57.14	80	36.87	382	51.07
OTHER	27		40		57		7		6		55		22		1		47		131	
28 I WOULD NOT WANT THE WHOLE COURSE TAUGHT ON PLATO																				
AGREE	275	82.58	110	82.71	158	81.44	85	85.86	69	84.15	205	84.71	164	84.54	18	81.82	172	78.54	628	82.74
DISAGREE	58	17.42	23	17.29	36	18.56	14	14.14	13	15.85	37	15.29	30	15.46	4	18.18	47	21.46	131	17.26
OTHER	19		39		56		6		4		52		19		0		45		120	
29 I OFTEN CONTINUED WORKING ON PLATO AT END OF CLASS PERIOD																				
AGREE	250	74.85	96	71.11	134	68.72	65	65.00	59	70.24	172	71.07	147	75.00	18	81.82	149	67.73	545	71.34
DISAGREE	84	25.15	39	28.89	61	31.28	35	35.00	25	29.76	70	28.93	49	25.00	4	18.18	71	32.27	219	28.66
OTHER	18		37		55		5		2		52		17		0		44		115	
30 USING PLATO IS DEHUMANIZING																				
AGREE	29	8.84	26	19.26	26	13.54	9	9.18	9	11.11	28	11.62	26	13.47	2	9.09	25	11.57	90	11.95
DISAGREE	299	91.16	109	80.74	166	86.46	89	90.82	72	88.89	213	88.38	167	86.53	20	90.91	191	88.43	663	88.05
OTHER	24		37		58		7		5		53		20		0		48		126	
31 I WOULD USE PLATO MORE IF TERMINALS NOT BEING USED SO MUCH																				
AGREE	221	67.17	63	48.46	135	69.59	35	34.65	54	65.06	158	66.39	107	56.02	15	68.18	120	54.55	454	60.21
DISAGREE	108	32.83	67	51.54	59	30.41	66	65.35	29	34.94	80	33.61	84	43.98	7	31.82	100	45.45	300	39.79
OTHER	23		42		56		4		3		56		22		0		44		125	
32 I PREFER TO SHARE PLATO TERMINAL WITH ANOTHER STUDENT																				
AGREE	98	29.70	41	30.83	53	27.32	14	14.14	20	24.10	84	34.85	55	28.35	5	23.81	42	19.35	206	27.25
DISAGREE	232	70.30	92	69.17	141	72.68	85	85.86	63	75.90	157	65.15	139	71.65	16	76.19	175	80.65	550	72.75
OTHER	22		39		56		6		3		53		19		1		47		123	
33 USING PLATO TAKES VALUABLE TIME AWAY FROM REGULAR CLASS																				
AGREE	48	14.37	35	26.32	41	21.03	9	9.00	20	23.81	47	19.34	41	21.35	2	9.09	23	10.41	133	17.45
DISAGREE	286	85.63	98	73.68	154	78.97	91	91.00	64	76.19	196	80.66	151	73.65	20	90.91	198	89.59	629	82.55
OTHER	18		39		55		5		2		51		21		0		43		117	
34 USING PLATO WAS OF NO HELP TO ME IN THIS COURSE																				
AGREE	32	9.55	25	19.23	18	9.23	9	8.91	8	9.64	31	12.81	24	12.50	3	13.64	18	8.11	84	11.04
DISAGREE	303	90.45	105	80.77	177	90.77	92	91.09	75	90.36	211	87.19	168	87.50	19	86.36	204	91.89	677	88.96
OTHER	17		42		55		4		3		52		21		0		42		118	
35 USING PLATO IS BORING																				
AGREE	31	9.23	24	18.75	20	10.31	12	11.88	6	7.32	29	11.93	26	13.54	2	9.09	24	10.91	87	11.46
DISAGREE	305	90.77	104	81.25	174	89.69	89	88.12	76	92.68	214	88.07	166	86.46	20	90.91	196	89.09	672	88.54
OTHER	16		44		56		4		4		51		21		0		44		120	

(CONTINUED)

Table 6.3.1a (con't)

STUDENT SURVEY FALL 1975 (ITEMS UNIQUE TO PLATO)

	I - PL		II - PL		III - PL		IV - PL		ACT - PL		BIO - PL		CHM - PL		MTH - PL		ENG - PL		TOT - PL	
TOTAL OBS.	352		172		250		105		86		294		213		22		264		879	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
36 TOO MUCH TIME IN THIS COURSE WAS SPENT USING PLATO																				
AGREE	15	4.53	23	17.69	13	6.67	10	9.90	9	10.71	11	4.58	28	14.66	1	4.55	12	5.45	61	8.06
DISAGREE	316	95.47	107	82.31	182	93.33	91	90.10	75	89.29	229	95.42	163	85.34	21	95.45	208	94.55	696	91.94
OTHER	21		42		55		4		2		54		22		0		44		122	
37 IN GENERAL, MOST PLATO LESSONS ARE TOO HARD																				
AGREE	28	8.41	19	14.62	37	18.97	5	4.95	12	14.29	31	12.86	23	11.92	1	4.76	22	10.00	89	11.73
DISAGREE	305	91.59	111	85.38	158	81.03	96	95.05	72	85.71	210	87.14	170	88.08	20	95.24	198	90.00	670	88.27
OTHER	19		42		55		4		2		53		20		1		44		12[illegible]	
38 LIKE PLATO BECAUSE MAKE MISTAKES WITHOUT BEING EMBARRASSED																				
AGREE	262	78.68	89	67.94	151	78.24	83	83.00	62	75.61	182	75.83	138	71.50	19	86.36	184	83.64	585	77.28
DISAGREE	71	21.32	42	32.06	42	21.76	17	17.00	20	24.39	58	24.17	55	28.50	3	13.64	36	16.36	172	22.72
OTHER	19		41		57		5		4		54		20		0		44		122	
39 PLATO SEEMED TO KNOW WHEN I DIDN'T UNDERSTAND MATERIAL																				
AGREE	269	80.54	84	64.12	125	65.10	61	61.00	55	66.27	179	74.27	113	58.55	19	86.36	173	79.36	539	71.20
DISAGREE	65	19.46	47	35.88	67	34.90	39	39.00	28	33.73	62	25.73	80	41.45	3	13.64	45	20.64	218	28.80
OTHER	18		41		58		5		3		53		20		0		46		122	
40 PLATO MADE HELPFUL COMMENTS ON MY WORK																				
AGREE	296	88.62	101	76.52	135	70.68	65	65.00	65	78.31	192	79.34	137	70.98	21	95.45	182	83.87	597	78.86
DISAGREE	38	11.38	31	23.48	56	29.32	35	35.00	18	21.69	50	20.66	56	29.02	1	4.55	35	16.13	160	21.14
OTHER	18		40		59		5		3		52		20		0		47		122	
41 PLATO DID NOT GIVE CLEAR EXPLANATIONS OF MATERIAL																				
AGREE	44	13.50	28	21.88	47	24.74	20	20.00	15	18.29	40	16.88	48	25.26	4	19.05	32	14.95	139	18.68
DISAGREE	282	86.50	100	78.13	143	75.26	80	80.00	67	81.71	197	83.12	142	74.74	17	80.95	182	85.05	605	81.32
OTHER	26		44		60		5		4		57		23		1		50		135	
42 PLATO MADE GOOD USE OF EXAMPLES AND ILLUSTRATIONS																				
AGREE	305	92.15	114	87.69	172	90.05	88	87.13	73	89.02	219	91.25	165	85.49	20	90.91	202	93.52	679	90.17
DISAGREE	26	7.85	16	12.31	19	9.95	13	12.87	9	10.98	21	8.75	28	14.51	2	9.09	14	6.48	74	9.83
OTHER	21		42		59		4		4		54		20		0		48		126	
43 DON'T LIKE PLATO-WON'T LET YOU GO ON TIL SHOW YOU KNOW POINT																				
AGREE	63	18.98	39	30.00	81	42.41	26	25.74	25	30.49	59	24.48	69	35.94	5	22.73	51	23.50	209	27.72
DISAGREE	269	81.02	91	70.00	110	57.59	75	74.26	57	69.51	182	75.52	123	64.06	17	77.27	166	76.50	545	72.28
OTHER	20		42		59		4		4		53		21		0		47		125	
44 LIKE PLATO BECAUSE IT LETS STUDENTS TAKE PART AT EACH STEP																				
AGREE	307	92.75	113	88.28	173	89.64	89	88.12	79	94.05	216	90.38	169	88.48	21	95.45	197	90.78	682	90.57
DISAGREE	24	7.25	15	11.72	20	10.36	12	11.88	5	5.95	23	9.62	22	11.52	1	4.55	20	9.22	71	9.43
OTHER	21		44		57		4		2		55		22		0		47		126	
45 I WOULD TAKE ANOTHER COURSE THAT USES PLATO																				
AGREE	290	87.61	97	76.98	156	82.98	83	83.00	74	90.24	199	83.61	154	81.91	20	90.91	179	83.26	626	84.03
DISAGREE	41	12.39	29	23.02	32	17.02	17	17.00	8	9.76	39	16.39	34	18.09	2	9.09	36	16.74	119	15.97
OTHER	21		46		62		5		4		56		25		0		49		134	

Table 6.3.1b

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STUDENT SURVEY  SPRING 1976 (ITEMS UNIQUE TO PLATO)
RESPONSES GROUPED BY COLLEGE

                 I - PL        II - PL       III - PL       IV - PL        V - PL       TOT - PL
TOTAL OBS.         252           107           118            39            163           679

                 N     %       N     %       N     %       N     %       N     %       N     %

 26  IN THIS COURSE, I USED PLATO FOR PART OF MY INSTRUCTION
   AGREE        222  92.89    94  95.92     95  95.00     38  97.44    142  91.61    591  93.66
   DISAGREE      17   7.11     4   4.08      5   5.00      1   2.56     13   8.39     40   6.34
   OTHER         13            9            18             0             8            48

 27  PLATO COURSE MATERIAL HELPED ME LEARN BETTER THAN LECTURE
   AGREE         95  40.95    39  40.21     52  53.61     12  35.29     43  28.67    241  39.51
   DISAGREE     137  59.05    58  59.79     45  46.39     22  64.71    107  71.33    369  60.49
   OTHER         20           10            21             5            13            69

 28  I WOULD NOT WANT THE WHOLE COURSE TAUGHT ON PLATO
   AGREE        198  83.19    79  79.80     81  81.00     35  89.74    105  68.63    498  79.17
   DISAGREE      40  16.81    20  20.20     19  19.00      4  10.26     48  31.37    131  20.83
   OTHER         14            8            18             0            10            50

 29  I OFTEN CONTINUED WORKING ON PLATO AT END OF CLASS PERIOD
   AGREE        179  74.90    69  69.70     63  63.64     30  76.92     91  59.48    432  68.68
   DISAGREE      60  25.10    30  30.30     36  36.36      9  23.08     62  40.52    197  31.32
   OTHER         13            8            19             0            10            50

 30  USING PLATO IS DEHUMANIZING
   AGREE         31  13.36    13  14.29     18  18.95      7  18.92     30  20.00     99  16.36
   DISAGREE     201  86.64    78  85.71     77  81.05     30  81.08    120  80.00    506  83.64
   OTHER         20           16            23             2            13            74

 31  I WOULD USE PLATO MORE IF TERMINALS NOT BEING USED SO MUCH
   AGREE        144  61.28    60  60.61     57  57.58      8  21.05     82  55.03    351  56.61
   DISAGREE      91  38.72    39  39.39     42  42.42     30  78.95     67  44.97    269  43.39
   OTHER         17            8            19             1            14            59

 32  I PREFER TO SHARE PLATO TERMINAL WITH ANOTHER STUDENT
   AGREE         64  26.78    35  35.35     34  34.34      7  19.44     39  26.17    179  28.78
   DISAGREE     175  73.22    64  64.65     65  65.66     29  80.56    110  73.83    443  71.22
   OTHER         13            8            19             3            14            57

 33  USING PLATO TAKES VALUABLE TIME AWAY FROM REGULAR CLASS
   AGREE         36  15.13    22  22.22     18  18.75     14  35.90     25  16.23    115  18.37
   DISAGREE     202  84.87    77  77.78     78  81.25     25  64.10    129  83.77    511  81.63
   OTHER         14            8            22             0             9            53

 34  USING PLATO WAS OF NO HELP TO ME IN THIS COURSE
   AGREE         26  11.06    13  13.54     12  12.12      6  15.38     13   8.55     70  11.27
   DISAGREE     209  88.94    83  86.46     87  87.88     33  84.62    139  91.45    551  88.73
   OTHER         17           11            19             0            11            58

 35  USING PLATO IS BORING
   AGREE         39  16.46    17  17.35     21  21.21     12  30.77      7   4.58     96  15.34
   DISAGREE     198  83.54    81  82.65     78  78.79     27  69.23    146  95.42    530  84.66
   OTHER         15            9            19             0            10            53
                                                                                    (CONTINUED)
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Table 6.3.1b (con't)
STUDENT SURVEY SPRING 1976 (ITEMS UNIQUE TO PLATO)
RESPONSES GROUPED BY COLLEGE

	I - PL		II - PL		III - PL		IV - PL		V - PL		TOT - PL	
TOTAL OBS.	252		107		118		39		163		679	
	N	%	N	%	N	%	N	%	N	%	N	%
36 TOO MUCH TIME IN THIS COURSE WAS SPENT USING PLATO												
AGREE	14	5.91	9	9.57	19	19.19	4	11.11	5	3.23	51	8.21
DISAGREE	223	94.09	85	90.43	80	80.81	32	88.89	150	96.77	570	91.79
OTHER	15		13		19		3		8		58	
37 IN GENERAL, MOST PLATO LESSONS ARE TOO HARD												
AGREE	27	11.44	14	14.43	8	8.16	1	2.70	22	14.38	72	11.59
DISAGREE	209	88.56	83	85.57	90	91.84	36	97.30	131	85.62	549	88.41
OTHER	16		10		20		2		10		58	
38 LIKE PLATO BECAUSE MAKE MISTAKES WITHOUT BEING EMBARRASSED												
AGREE	190	80.17	72	75.00	75	75.00	26	68.42	128	84.77	491	78.94
DISAGREE	47	19.83	24	25.00	25	25.00	12	31.58	23	15.23	131	21.06
OTHER	15		11		18		1		12		57	
39 PLATO SEEMED TO KNOW WHEN I DIDN'T UNDERSTAND MATERIAL												
AGREE	176	74.26	79	81.44	62	63.27	22	56.41	126	82.89	465	74.64
DISAGREE	61	25.74	18	18.56	36	36.73	17	43.59	26	17.11	158	25.36
OTHER	15		10		20		0		11		56	
40 PLATO MADE HELPFUL COMMENTS ON MY WORK												
AGREE	205	86.50	85	87.63	73	73.00	23	60.53	137	91.33	523	84.08
DISAGREE	32	13.50	12	12.37	27	27.00	15	39.47	13	8.67	99	15.92
OTHER	15		10		18		1		13		57	
41 PLATO DID NOT GIVE CLEAR EXPLANATIONS OF MATERIAL												
AGREE	52	22.13	17	17.71	22	22.22	13	34.21	29	18.95	133	21.42
DISAGREE	183	77.87	79	82.29	77	77.78	25	65.79	124	81.05	488	78.58
OTHER	17		11		19		1		10		58	
42 PLATO MADE GOOD USE OF EXAMPLES AND ILLUSTRATIONS												
AGREE	209	88.19	87	89.69	80	82.47	30	76.92	141	92.76	547	87.94
DISAGREE	28	11.81	10	10.31	17	17.53	9	23.08	11	7.24	75	12.06
OTHER	15		10		21		0		11		57	
43 DON'T LIKE PLATO-WON'T LET YOU GO ON TIL SHOW YOU KNOW POINT												
AGREE	53	22.65	34	34.69	32	32.32	22	57.89	38	25.33	179	28.92
DISAGREE	181	77.35	64	65.31	67	67.68	16	42.11	112	74.67	440	71.08
OTHER	16		9		19		1		13		60	
44 LIKE PLATO BECAUSE IT LETS STUDENTS TAKE PART AT EACH STEP												
AGREE	211	89.79	87	88.78	86	86.87	30	81.08	147	96.71	561	90.34
DISAGREE	24	10.21	11	11.22	13	13.13	7	18.92	5	3.29	60	9.66
OTHER	17		9		19		2		11		58	
45 I WOULD TAKE ANOTHER COURSE THAT USES PLATO												
AGREE	196	82.70	82	84.54	78	79.59	24	66.67	129	84.31	509	81.96
DISAGREE	41	17.30	15	15.46	20	20.41	12	33.33	24	15.69	112	18.04
OTHER	15		10		20		3		10		58	

Table 6.3.1c

STUDENT SURVEY SPRING 1976 (ITEMS UNIQUE TO PLATO) COLLEGES I,II & III ONLY
RESPONSES GROUPED BY SUBJECT AREA

	ACT - PL		BIO - PL		CHM - PL		MTH - PL		ENG - PL		TOT - PL	
TOTAL OBS.	36		146		114		21		160		477	
	N	%	N	%	N	%	N	%	N	%	N	%
26 IN THIS COURSE, I USED PLATO FOR PART OF MY INSTRUCTION												
AGREE	32	94.12	126	94.03	102	96.23	20	100.00	131	91.61	411	94.05
DISAGREE	2	5.88	8	5.97	4	3.77	0	0.0	12	8.39	26	5.95
OTHER	2		12		8		1		17		40	
27 PLATO COURSE MATERIAL HELPED ME LEARN BETTER THAN LECTURE												
AGREE	12	35.29	57	44.53	47	45.19	4	21.05	66	46.81	186	43.66
DISAGREE	22	64.71	71	55.47	57	54.81	15	78.95	75	53.19	240	56.34
OTHER	2		18		10		2		19		51	
28 I WOULD NOT WANT THE WHOLE COURSE TAUGHT ON PLATO												
AGREE	32	94.12	107	80.45	87	82.08	20	95.24	112	78.32	358	81.92
DISAGREE	2	5.88	26	19.55	19	17.92	1	4.76	31	21.68	79	18.08
OTHER	2		13		8		0		17		40	
29 I OFTEN CONTINUED WORKING ON PLATO AT END OF CLASS PERIOD												
AGREE	17	50.00	105	78.95	79	74.53	17	85.00	93	64.58	311	71.17
DISAGREE	17	50.00	28	21.05	27	25.47	3	15.00	51	35.42	126	28.83
OTHER	2		13		8		1		16		40	
30 USING PLATO IS DEHUMANIZING												
AGREE	10	31.25	12	9.30	14	13.86	2	10.53	24	17.52	62	14.83
DISAGREE	22	68.75	117	90.70	87	86.14	17	89.47	113	82.48	356	85.17
OTHER	4		17		13		2		23		59	
31 I WOULD USE PLATO MORE IF TERMINALS NOT BEING USED SO MUCH												
AGREE	14	41.18	89	67.94	71	66.98	12	63.16	75	52.45	261	60.28
DISAGREE	20	58.82	42	32.06	35	33.02	7	36.84	68	47.55	172	39.72
OTHER	2		15		8		2		17		44	
32 I PREFER TO SHARE PLATO TERMINAL WITH ANOTHER STUDENT												
AGREE	14	41.18	42	31.82	33	31.13	4	19.05	40	27.78	133	30.43
DISAGREE	20	58.82	90	68.18	73	68.87	17	80.95	104	72.22	304	69.57
OTHER	2		14		8		0		16		40	
33 USING PLATO TAKES VALUABLE TIME AWAY FROM REGULAR CLASS												
AGREE	11	32.35	19	14.29	18	17.14	5	25.00	23	16.31	76	17.55
DISAGREE	23	67.65	114	85.71	87	82.86	15	75.00	118	83.69	357	82.45
OTHER	2		13		9		1		19		44	
34 USING PLATO WAS OF NO HELP TO ME IN THIS COURSE												
AGREE	7	20.59	14	10.77	12	11.54	3	15.00	15	10.56	51	11.86
DISAGREE	27	79.41	116	89.23	92	88.46	17	85.00	127	89.44	379	88.14
OTHER	2		16		10		1		18		47	
35 USING PLATO IS BORING												
AGREE	11	32.35	21	16.03	16	15.09	3	14.29	26	18.31	77	17.74
DISAGREE	23	67.65	110	83.97	90	84.91	18	85.71	116	81.69	357	82.26
OTHER	2		15		8		0		18		43	

(CONTINUED)

Table 6.3.1c (con't)

STUDENT SURVEY SPRING 1976 (ITEMS UNIQUE TO PLATO) COLLEGES I,II & III ONLY
RESPONSES GROUPED BY SUBJECT AREA

	ACT - PL		BIO - PL		CHM - PL		MTH - PL		ENG - PL		TOT - PL	
TOTAL OBS.	36		146		114		21		160		477	
	N	%	N	%	N	%	N	%	N	%	N	%
36 TOO MUCH TIME IN THIS COURSE WAS SPENT USING PLATO												
AGREE	11	32.35	7	5.34	11	10.68	2	9.52	11	7.80	42	9.77
DISAGREE	23	67.65	124	94.66	92	89.32	19	90.48	130	92.20	388	90.23
OTHER	2		15		11		0		19		47	
37 IN GENERAL, MOST PLATO LESSONS ARE TOO HARD												
AGREE	5	15.15	24	18.46	8	7.62	3	14.29	9	6.34	49	11.37
DISAGREE	28	84.85	106	81.54	97	92.38	18	85.71	133	93.66	382	88.63
OTHER	3		16		9		0		18		46	
38 LIKE PLATO BECAUSE MAKE MISTAKES WITHOUT BEING EMBARRASSED												
AGREE	22	64.71	107	81.06	80	76.19	12	60.00	116	81.69	337	77.83
DISAGREE	12	35.29	25	18.94	25	23.81	8	40.00	26	18.31	96	22.17
OTHER	2		14		9		1		18		44	
39 PLATO SEEMED TO KNOW WHEN I DIDN'T UNDERSTAND MATERIAL												
AGREE	22	64.71	89	66.92	80	76.92	12	57.14	114	81.43	317	73.38
DISAGREE	12	35.29	44	33.08	24	23.08	9	42.86	26	18.57	115	26.62
OTHER	2		13		10		0		20		45	
40 PLATO MADE HELPFUL COMMENTS ON MY WORK												
AGREE	23	67.65	107	81.06	87	82.86	16	80.00	130	90.91	363	83.64
DISAGREE	11	32.35	25	18.94	18	17.14	4	20.00	13	9.09	71	16.36
OTHER	2		14		9		1		17		43	
41 PLATO DID NOT GIVE CLEAR EXPLANATIONS OF MATERIAL												
AGREE	13	38.24	28	21.54	19	18.27	9	45.00	22	15.49	91	21.16
DISAGREE	21	61.76	102	78.46	85	81.73	11	55.00	120	84.51	339	78.84
OTHER	2		16		10		1		18		47	
42 PLATO MADE GOOD USE OF EXAMPLES AND ILLUSTRATIONS												
AGREE	22	68.75	116	88.55	93	88.57	13	61.90	132	92.96	376	87.24
DISAGREE	10	31.25	15	11.45	12	11.43	8	38.10	10	7.04	55	12.76
OTHER	4		15		9		0		18		46	
43 DON'T LIKE PLATO-WON'T LET YOU GO ON TIL SHOW YOU KNOW POINT												
AGREE	12	35.29	31	23.66	35	33.02	3	14.29	38	27.34	119	27.61
DISAGREE	22	64.71	100	76.34	71	66.98	18	85.71	101	72.66	312	72.39
OTHER	2		15		8		0		21		46	
44 LIKE PLATO BECAUSE IT LETS STUDENTS TAKE PART AT EACH STEP												
AGREE	27	79.41	120	91.60	93	87.74	17	85.00	127	90.07	384	88.89
DISAGREE	7	20.59	11	8.40	13	12.26	3	15.00	14	9.93	48	11.11
OTHER	2		15		8		1		19		45	
45 I WOULD TAKE ANOTHER COURSE THAT USES PLATO												
AGREE	24	72.73	110	82.71	90	86.54	16	80.00	116	81.69	356	82.41
DISAGREE	9	27.27	23	17.29	14	13.46	4	20.00	26	18.31	76	17.59
OTHER	3		13		10		1		18		45	

Table 6.4.1a

STUDENT SURVEY FALL 1975 (ITEMS UNIQUE TO NO PLATO)

	I-N PL		II-N PL		III-N PL		IV-N PL		ACT-N PL		BIO-N PL		CHM-N PL		MTH-N PL		ENG-N PL		TOT-N PL	
TOTAL OBS.	274		136		183		86		66		144		145		11		313		679	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
26 HAVE YOU HEARD ABOUT PLATO TERMINALS IN YOUR SCHOOL																				
YES	173	70.90	117	90.70	120	77.42	76	93.83	40	68.97	100	86.21	115	85.19	4	40.00	227	78.28	486	79.80
NO	71	29.10	12	9.30	35	22.58	5	6.17	18	31.03	16	13.79	20	14.81	6	60.00	63	21.72	123	20.20
OTHER	30		7		26		5		8		28		10		1		23		70	
27 HAS ANYONE SHOWED YOU HOW PLATO TERMINALS WORK																				
YES	100	40.82	81	62.79	63	40.38	51	62.96	24	41.38	67	57.76	76	56.30	2	20.00	126	43.15	295	48.28
NO	145	59.18	48	37.21	93	59.62	30	37.04	34	58.62	49	42.24	59	43.70	8	80.00	166	56.85	316	51.72
OTHER	29		7		27		5		8		28		10		1		21		68	
28 EVER DISCUSSED PLATO WITH OTHER STUDENTS OR TEACHER																				
YES	117	47.76	80	62.50	67	43.51	54	67.50	21	36.21	66	56.90	73	54.48	2	20.00	156	53.98	318	52.39
NO	128	52.24	48	37.50	87	56.49	26	32.50	37	63.79	50	43.10	61	45.52	8	80.00	133	46.02	289	47.61
OTHER	29		8		29		6		8		28		11		1		24		72	
29 HAVE YOU EVER USED A PLATO TERMINAL YOURSELF																				
YES	82	33.74	72	56.25	58	37.42	36	44.44	24	41.38	58	50.00	67	49.63	2	20.00	97	33.68	248	40.86
NO	161	66.26	56	43.75	97	62.58	45	55.56	34	58.62	58	50.00	68	50.37	8	80.00	191	66.32	359	59.14
OTHER	31		8		28		5		8		28		10		1		25		72	
30 DO YOU WISH THIS COURSE HAD BEEN TAUGHT USING PLATO																				
YES	76	34.23	39	33.62	61	40.13	34	42.50	23	41.07	34	30.36	53	42.06	4	40.00	96	36.09	210	36.84
NO	146	65.77	77	66.38	91	59.87	46	57.50	33	58.93	78	69.64	73	57.94	6	60.00	170	63.91	360	63.16
OTHER	52		20		31		6		10		32		19		1		47		109	
31 DO YOU THINK STUDENTS WHO USED PLATO WERE LUCKY																				
YES	81	37.33	56	49.12	57	38.51	31	40.79	29	53.70	39	35.14	57	45.24	3	37.50	97	37.89	225	40.54
NO	136	62.67	58	50.88	91	61.49	45	59.21	25	46.30	72	64.86	69	54.76	5	62.50	159	62.11	330	59.46
OTHER	57		22		35		10		12		33		19		3		57		124	
32 LIKE TO TAKE COURSE NEXT SEMESTER THAT USES PLATO																				
YES	117	51.32	68	57.63	82	54.30	45	56.25	37	68.52	51	45.13	71	55.04	6	60.00	147	54.24	312	54.07
NO	111	48.68	50	42.37	69	45.70	35	43.75	17	31.48	62	54.87	58	44.96	4	40.00	124	45.76	265	45.93
OTHER	46		18		32		6		12		31		16		1		42		102	
33 DID YOU USE PLATO TERMINAL ANY TIME THIS SEMESTER																				
YES	45	18.67	59	46.46	42	27.27	20	24.69	12	21.05	28	24.14	41	30.60	1	10.00	84	29.37	166	27.53
NO	196	81.33	68	53.54	112	72.73	61	75.31	45	78.95	88	75.86	93	69.40	9	90.00	202	70.63	437	72.47
OTHER	33		9		29		5		9		28		11		1		27		76	

(CONTINUED)

Table 6.4.1a (con't)

STUDENT SURVEY FALL 1975 (ITEMS UNIQUE TO NO PLATO)

	I-N PL		II-N PL		III-N PL		IV-N PL		ACT-N PL		BIO-N PL		CHM-N PL		MTH-N PL		ENG-N PL		TOT-N PL	
TOTAL OBS.	274		136		163		80		66		144		145		11		313		679	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
34 DID YOU USE PLATO TERMINAL FOR ANY WORK IN THIS COURSE																				
YES	9	3.75	23	18.25	2	1.31	2	2.50	1	1.75	8	6.96	9	6.82	1	10.00	17	5.96	36	6.01
NO	231	96.25	103	81.75	151	98.69	78	97.50	56	98.25	107	93.04	123	93.18	9	90.00	268	94.04	563	93.99
OTHER	34		10		30		6		9		29		13		1		28		80	
35 HOURS SPENT USING PLATO TERMINAL FOR WORK IN THIS COURSE																				
ONE	1	0.46	3	2.73	3	2.14	0	0.0	0	0.0	0	0.0	1	0.89	0	0.0	6	2.22	7	1.29
TWO	3	1.38	8	7.27	1	0.71	1	1.35	0	0.0	1	1.04	5	4.46	0	0.0	7	2.59	13	2.40
THREE	1	0.46	7	6.36	1	0.71	1	1.35	0	0.0	0	0.0	4	3.57	0	0.0	6	2.22	10	1.85
FOUR	5	2.30	3	2.73	2	1.43	1	1.35	0	0.0	3	3.13	1	0.89	0	0.0	7	2.59	11	2.03
> 4	2	0.92	5	4.55	2	1.43	0	0.0	0	0.0	2	2.08	1	0.89	1	10.00	5	1.85	9	1.66
NO PLATO	205	94.47	84	76.36	131	93.57	71	95.95	53	100.00	90	93.75	100	89.29	9	90.00	239	88.52	491	90.76
OTHER	57		26		43		12		13		48		33		1		43		138	

Table 6.4.1b

STUDENT SURVEY SPRING 1970 (ITEMS UNIQUE TO NO PLATO)

	I-N PL		II-N PL		III-N PL		ACT-N PL		BIO-N PL		CHM-N PL		MTH-N PL		ENG-N PL		TOT-N PL	
TOTAL OBS.	160		67		80		50		101		15		17		124		307	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
26 HAVE YOU HEARD ABOUT PLATO TERMINALS IN YOUR SCHOOL																		
YES	113	76.35	60	96.77	55	78.57	29	67.44	82	94.25	13	100.00	13	76.47	91	75.83	228	81.43
NO	35	23.65	2	3.23	15	21.43	14	32.56	5	5.75	0	0.0	4	23.53	29	24.17	52	18.57
OTHER	12		5		10		7		14		2		0		4		27	
27 HAS ANYONE SHOWED YOU HOW PLATO TERMINALS WORK																		
YES	64	43.24	45	73.77	31	44.29	21	48.84	56	64.37	3	66.67	7	41.18	48	40.00	140	50.18
NO	84	56.76	16	26.23	39	55.71	22	51.16	31	35.63	4	33.33	10	58.82	72	60.00	139	49.82
OTHER	12		6		10		7		14		3		0		4		28	
28 EVER DISCUSSED PLATO WITH OTHER STUDENTS OR TEACHER																		
YES	76	51.35	43	71.67	35	50.00	20	46.51	60	68.97	9	75.00	9	52.94	56	47.06	154	55.40
NO	72	48.65	17	28.33	35	50.00	23	53.49	27	31.03	3	25.00	8	47.06	63	52.94	124	44.60
OTHER	12		7		10		7		14		3		0		5		29	
29 HAVE YOU EVER USED A PLATO TERMINAL YOURSELF																		
YES	62	42.47	41	66.13	27	38.57	19	44.19	52	59.77	8	61.54	7	41.18	44	37.29	130	46.76
NO	84	57.53	21	33.87	43	61.43	24	55.81	35	40.23	5	38.46	10	58.82	74	62.71	148	53.24
OTHER	14		5		10		7		14		2		0		6		29	
30 DO YOU WISH THIS COURSE HAD BEEN TAUGHT USING PLATO																		
YES	53	38.41	19	32.20	29	45.31	14	36.84	35	41.18	3	30.00	9	56.25	40	35.71	101	38.70
NO	85	61.59	40	67.80	35	54.69	24	63.16	50	58.82	7	70.00	7	43.75	72	64.29	160	61.30
OTHER	22		8		16		12		16		5		1		12		46	
31 DO YOU THINK STUDENTS WHO USED PLATO WERE LUCKY																		
YES	62	45.93	31	53.45	28	43.75	16	43.24	42	50.60	7	58.33	10	66.67	46	41.82	121	47.08
NO	73	54.07	27	46.55	36	56.25	21	56.76	41	49.40	5	41.67	5	33.33	64	58.18	136	52.92
OTHER	25		9		16		13		18		3		2		14		50	
32 LIKE TO TAKE COURSE NEXT SEMESTER THAT USES PLATO																		
YES	80	57.55	38	63.33	39	60.00	23	60.53	50	60.24	8	61.54	11	73.33	65	56.52	157	59.47
NO	59	42.45	22	36.67	26	40.00	15	39.47	33	39.76	5	38.46	4	26.67	50	43.48	107	40.53
OTHER	21		7		15		12		18		2		2		9		43	
33 DID YOU USE PLATO TERMINAL ANY TIME THIS SEMESTER																		
YES	34	23.13	26	42.62	14	20.90	12	30.00	22	25.29	7	58.33	5	29.41	28	23.53	74	26.91
NO	113	76.87	35	57.38	53	79.10	28	70.00	65	74.71	5	41.67	12	70.59	91	76.47	201	73.09
OTHER	13		6		13		10		14		3		0		5		32	

(CONTINUED)

Table 6.4.1b (con't)

STUDENT SURVEY SPRING 1976 (ITEMS UNIQUE TO NO PLATO)

	I-N PL		II-N PL		III-N PL		ACT-N PL		BIO-N PL		CHM-N PL		MTH-N PL		ENG-N PL		TOT-N PL	
TOTAL OBS.	160		67		80		50		101		15		17		124		307	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
34 DID YOU USE PLATO TERMINAL FOR ANY WORK IN THIS COURSE																		
YES	12	8.11	10	16.67	2	2.99	3	7.50	5	5.75	7	56.33	2	11.76	7	5.88	24	8.73
NO	136	91.89	50	83.33	65	97.01	37	92.50	82	94.25	5	41.67	15	88.24	112	94.12	251	91.27
OTHER	12		7		13		10		14		3		0		5		32	
35 HOURS SPENT USING PLATO TERMINAL FOR WORK IN THIS COURSE																		
ONE	10	7.81	3	5.88	2	3.28	2	5.00	4	5.33	2	18.18	1	8.33	6	5.88	15	6.25
TWO	2	1.56	0	0.0	1	1.64	2	5.00	1	1.33	0	0.0	0	0.0	0	0.0	3	1.25
THREE	2	1.56	1	1.96	1	1.64	2	5.00	1	1.33	0	0.0	0	0.0	1	0.98	4	1.67
FOUR	0	0.0	3	5.88	0	0.0	0	0.0	0	0.0	3	27.27	0	0.0	0	0.0	3	1.25
> 4	4	3.13	3	5.88	1	1.64	0	0.0	1	1.33	2	18.18	0	0.0	5	4.90	8	3.33
NO PLATO	110	85.94	41	80.39	56	91.80	34	85.00	68	90.67	4	36.36	11	91.67	90	88.24	207	86.25
OTHER	32		16		19		10		26		4		5		22		67	

STUDENT SURVEY I

Your college will be using computers in some classes this year. Even though you may not use any computers yourself this year, we would like to find out what you think about the use of computers in college classes. Thank you for your cooperation.

Name: ______________________ Date: ______________________

College: ______________________

Course Name and Number: ______________________

Section Number: ______________________ Instructor: ______________________

1. Do you think a computer would help fit your instruction to your needs?

   Yes ☐ No ☐ Not Sure ☐

2. Do you think computer-assisted instruction would make you actively involved in your own learning?

   Yes ☐ No ☐ Not Sure ☐

3. Do you think that computers are too impersonal for student instruction?

   Yes ☐ No ☐ Not Sure ☐

4. Do you think that the mechanics of using a computer terminal could distract you from learning?

   Yes ☐ No ☐ Not Sure ☐

5. Do you think computer-assisted instruction would allow you to set a pace that is right for your ability level?

   Yes ☐ No ☐ Not Sure ☐

6. Do you think you would feel comfortable working with computers?

   Yes ☐ No ☐ Not Sure ☐

7. Do you think that computers ought to become more important in the everyday life of our society?

   Yes ☐ No ☐ Not Sure ☐

8. Do you think computer-assisted instruction would allow students to assume greater responsibility for their own learning?

   Yes ☐ No ☐ Not Sure ☐

026

STUDENT SURVEY

You are being asked to fill out this survey as part of a study about the use of computers in education. Although student names are needed for matching purposes, no student will be identified in any reports. For each statement, please check the response that is closest to your general overall opinion. Please complete both sides of the survey and try to respond to every question. Thank you for your cooperation.

Name ______________________________ Date ____________________

College ______________________________

Course and Section ____________________ Instructor ____________________

1. In this course I felt challenged to do my best work.......................... ☐ Agree ☐ Disagree
2. There was real concern for my progress in this course.......................... ☐ Agree ☐ Disagree
3. I tried to just finish the assignments rather than learn in this course........ ☐ Agree ☐ Disagree
4. I did not receive any individual attention in this course.......................... ☐ Agree ☐ Disagree
5. In this course I often met with my instructor outside of class time............ ☐ Agree ☐ Disagree
6. In this course I felt free to ask questions or express my opinion.............. ☐ Agree ☐ Disagree
7. I would not recommend this course to my friends.......................... ☐ Agree ☐ Disagree
8. Most of the work in this course was too hard.......................... ☐ Agree ☐ Disagree
9. In this course I often discussed the course material with other students....... ☐ Agree ☐ Disagree
10. In this course it was difficult to get help when I didn't understand the material.......................... ☐ Agree ☐ Disagree
11. Computers would help fit instruction to my needs.......................... ☐ Agree ☐ Disagree
12. Computers would make me actively involved in my own learning.......................... ☐ Agree ☐ Disagree
13. Computers are not good for instruction because they are always breaking down.......................... ☐ Agree ☐ Disagree
14. Computers are too impersonal for student instruction.......................... ☐ Agree ☐ Disagree
15. Computer-assisted instruction would allow me to set a pace that is right for my ability.......................... ☐ Agree ☐ Disagree
16. Computers are nothing but baby-sitters for the teacher.......................... ☐ Agree ☐ Disagree
17. Computer-assisted instruction would allow students to assume greater responsibility for their own learning.......................... ☐ Agree ☐ Disagree
18. The mechanics of using a computer terminal would distract me from learning..... ☐ Agree ☐ Disagree
19. I would feel comfortable working with computers.......................... ☐ Agree ☐ Disagree
20. I would never choose a course that is taught using a computer.......................... ☐ Agree ☐ Disagree
21. Computers ought to become more important in the everyday life of our society.......................... ☐ Agree ☐ Disagree
22. I looked forward to attending class in this course more than in other courses I took this semester.......................... ☐ Agree ☐ Disagree
23. Compared to other courses I've taken, this course was more challenging......... ☐ Agree ☐ Disagree
24. This course required more work than other courses I've taken.......................... ☐ Agree ☐ Disagree
25. For this course the number of hours per week I spent on homework outside of regularly scheduled class time was ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ More than 5

OVER

26. Have you heard about the PLATO computer terminals in your school? .... ☐ Yes ☐ No

27. Has anyone ever showed you how the PLATO terminals work? .... ☐ Yes ☐ No

28. Have you ever discussed PLATO with other students or a teacher? .... ☐ Yes ☐ No

29. Have you ever used a PLATO terminal yourself? .... ☐ Yes ☐ No

30. Do you wish this course had been taught using PLATO? .... ☐ Yes ☐ No

31. Do you think the students who used the PLATO terminals were lucky? .... ☐ Yes ☐ No

32. Would you like to take a course next semester that does use the PLATO computer terminals? .... ☐ Yes ☐ No

33. Did you use a PLATO terminal at any time during this semester? .... ☐ Yes ☐ No

34. Did you use a PLATO terminal for any work in this course? .... ☐ Yes ☐ No

35. If you did use a PLATO terminal for work in this course, approximately how many hours did you spend using it for this course? ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ More than 4 ☐ Did not use PLATO

THANK YOU

027

STUDENT SURVEY

You are being asked to fill out this survey as part of a study about the use of computers in education. Although student names are needed for matching purposes, no student will be identified in any reports. For each statement, please check the response that is closest to your general overall opinion. Please complete both sides of the survey and try to respond to every question. Thank you for your cooperation.

Name ______________________________ Date ____________________

College ______________________________

Course and Section ____________________ Instructor ____________________

1. In this course I felt challenged to do my best work ☐ Agree ☐ Disagree
2. There was real concern for my progress in this course ☐ Agree ☐ Disagree
3. I tried to just finish the assignments rather than learn in this course ☐ Agree ☐ Disagree
4. I did not receive any individual attention in this course ☐ Agree ☐ Disagree
5. In this course I often met with my instructor outside of class time ☐ Agree ☐ Disagree
6. In this course I felt free to ask questions or express my opinion ☐ Agree ☐ Disagree
7. I would not recommend this course to my friends ☐ Agree ☐ Disagree
8. Most of the work in this course was too hard ☐ Agree ☐ Disagree
9. In this course I often discussed the course material with other students ☐ Agree ☐ Disagree
10. In this course it was difficult to get help when I didn't understand the material ☐ Agree ☐ Disagree
11. Computers would help fit instruction to my needs ☐ Agree ☐ Disagree
12. Computers would make me actively involved in my own learning ☐ Agree ☐ Disagree
13. Computers are not good for instruction because they are always breaking down ☐ Agree ☐ Disagree
14. Computers are too impersonal for student instruction ☐ Agree ☐ Disagree
15. Computer-assisted instruction would allow me to set a pace that is right for my ability ☐ Agree ☐ Disagree
16. Computers are nothing but baby-sitters for the teacher ☐ Agree ☐ Disagree
17. Computer-assisted instruction would allow students to assume greater responsibility for their own learning ☐ Agree ☐ Disagree
18. The mechanics of using a computer terminal would distract me from learning ☐ Agree ☐ Disagree
19. I would feel comfortable working with computers ☐ Agree ☐ Disagree
20. I would never choose a course that is taught using a computer ☐ Agree ☐ Disagree
21. Computers ought to become more important in the everyday life of our society ☐ Agree ☐ Disagree
22. I looked forward to attending class in this course more than in other courses I took this semester ☐ Agree ☐ Disagree
23. Compared to other courses I've taken, this course was more challenging ☐ Agree ☐ Disagree
24. This course required more work than other courses I've taken ☐ Agree ☐ Disagree
25. For this course the number of hours per week I spent on homework outside of regularly scheduled class time was ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ More than 5

OVER

26. In this course, I used PLATO for part of my instruction........................ ☐ Agree ☐ Disagree

27. The course material presented on PLATO helped me learn better than the course material presented in class lectures........................ ☐ Agree ☐ Disagree

28. I would not want to have the whole course taught on PLATO........................ ☐ Agree ☐ Disagree

29. Even though I could have left PLATO at the end of the class period, I often continued working for a few minutes........................ ☐ Agree ☐ Disagree

30. Using PLATO is dehumanizing........................ ☐ Agree ☐ Disagree

31. I would use PLATO more if the terminals were not being used so much............. ☐ Agree ☐ Disagree

32. When using PLATO, I prefer to share a terminal with another student rather than work by myself........................ ☐ Agree ☐ Disagree

33. Using PLATO takes valuable time away from regular class time................. ☐ Agree ☐ Disagree

34. Using PLATO was of no help to me in this course........................ ☐ Agree ☐ Disagree

35. Using PLATO is boring........................ ☐ Agree ☐ Disagree

36. Too much time in this course was spent using PLATO........................ ☐ Agree ☐ Disagree

37. In general, most PLATO lessons are too hard........................ ☐ Agree ☐ Disagree

38. I like PLATO because a student can make mistakes without being embarrassed...... ☐ Agree ☐ Disagree

39. PLATO seemed to know when I didn't understand the material................ ☐ Agree ☐ Disagree

40. PLATO made helpful comments on my work........................ ☐ Agree ☐ Disagree

41. PLATO did not give clear explanations of the material........................ ☐ Agree ☐ Disagree

42. PLATO made good use of examples and illustrations........................ ☐ Agree ☐ Disagree

43. I do not like PLATO because it will not let you go on until you show that you know a particular point........................ ☐ Agree ☐ Disagree

44. I like PLATO because it lets students take part at each step in the lesson...... ☐ Agree ☐ Disagree

45. I would take another course that uses PLATO........................ ☐ Agree ☐ Disagree

PLEASE LIST THE THINGS YOU LIKED MOST ABOUT PLATO:

PLEASE LIST THE THINGS YOU DISLIKED THE MOST ABOUT PLATO:

THANK YOU

014

FACULTY QUESTIONNAIRE

Name ____ Date __________________________

Years of Teaching Experience ________________________

	PLATO	NON-PLATO	NO PREFERENCE
1. As the semester is drawing to a close, do you find that you prefer teaching the PLATO or the non-PLATO section?..................	☐	☐	☐
2. Which section(s) did you think you would prefer teaching before the semester began?......................................	☐	☐	☐
3. Which section appears to contain the more capable students?...........	☐	☐	☐
4. Which section appears to contain the more motivated students?.........	☐	☐	☐
5. Which section appears to contain the higher achieving students?.......	☐	☐	☐
6. Which section has had the better attendance record during the semester?...	☐	☐	☐
7. Which section required more of your time?..............................	☐	☐	☐
8. Have you had more contact with the students in the PLATO section or with the students in the non-PLATO section?........................	☐	☐	☐

9. There was some concern that non-PLATO students would complain about not being able to use PLATO. Have any of the students in your non-PLATO class expressed such complaints? If so, about how many of the students have done so?

10. Would you please list any differences that you have observed between the PLATO and non-PLATO sections. For example, was one class able to proceed more quickly?

PLATO

FACULTY QUESTIONNAIRE

As an instructor who has used PLATO, you are a primary source of information about the PLATO computer-based education system. Your perceptions of the system will provide an important basis for evaluating its strengths and weaknesses.

Space has been provided on the last page of the questionnaire for you to list any strengths and weaknesses of the PLATO system that have not been explicitly included in the body of the questionnaire. Please feel free to add additional pages, if necessary, to include any examples of studies you may have carried out yourself, illustrations of particular problems you may have encountered, or especially useful information that may contribute to a comprehensive evaluation of the PLATO system.

Thank you very much for your cooperation in filling out this questionnaire. We appreciate your working with Educational Testing Service in conducting the ongoing evaluation.

672-05

PLATO
FACULTY QUESTIONNAIRE

Name ______________________________ Date ____________________

Years of Teaching Experience ____________________

1. Approximately how long have you been using PLATO as part of student instruction?

   ☐ One semester ☐ Two semesters ☐ Three semesters ☐ Four semesters ☐ More than four semesters

2. Do you intend to use PLATO again if you teach the same course(s) that you taught this semester?

   ☐ Definitely ☐ Probably ☐ Not sure ☐ Probably not ☐ Definitely not

3. Which students do you think profit most from PLATO?

   ☐ Higher ability students ☐ Lower ability students ☐ All students profit equally

4. Do you think PLATO contributes toward better student attendance?

   ☐ Definitely ☐ Probably ☐ Not sure ☐ Probably not ☐ Definitely not

5. Do you give extra credit to students for using PLATO?

   ☐ Yes ☐ No

6. Is the use of PLATO by your students during the regularly scheduled PLATO lab required or voluntary?

   ☐ Required ☐ Voluntary

7. If more lessons and terminals become available will you use PLATO more than you do presently?

   ☐ Definitely ☐ Probably ☐ Not sure ☐ Probably not ☐ Definitely not

8. Could your entire course be taught on PLATO?

   ☐ Definitely ☐ Probably ☐ Not sure ☐ Probably not ☐ Definitely not

9. Should your entire course be taught on PLATO?

   ☐ Definitely ☐ Probably ☐ Not sure ☐ Probably not ☐ Definitely not

10. In what ways did you use PLATO this semester? (Please check all that apply.)

    ☐ To replace portions of classroom instruction
    ☐ To provide review and practice work
    ☐ To replace laboratory work
    ☐ To replace homework
    ☐ To supplement homework
    ☐ Other (please specify) ______________________________

    ____

11. What do you think is the optimal amount of the course to devote to PLATO?

☐ The entire course

☐ Two-thirds of the course

☐ One-half of the course

☐ One-third of the course

☐ Less than one-third of the course

☐ Other (please specify) ______________________________

____

12. Do PLATO students tend to evidence better attendance on days when the class is scheduled for the PLATO lab?

☐ Yes ☐ No ☐ Not sure

13. How much time do your students spend using PLATO outside of the regularly scheduled PLATO class?

☐ A great amount ☐ A small amount ☐ Very little ☐ None at all ☐ I don't know

14. Do you think students would spend more of their free time using PLATO if more terminals were available?

☐ Definitely ☐ Probably ☐ Not sure ☐ Probably not ☐ Definitely not

15. Do you think you have more or less contact with the students because of PLATO?

☐ Much more ☐ Somewhat more ☐ Somewhat less ☐ Much less ☐ About the same as without PLATO

16. To what extent has the use of PLATO affected the amount of work you do for the course?

☐ Great increase ☐ Slight increase ☐ No change ☐ Slight decrease ☐ Great decrease

17. Has the use of PLATO relieved you of any routine duties?

☐ Definitely ☐ Probably ☐ Not sure ☐ Probably not ☐ Definitely not

18. Has the use of PLATO affected your teaching methods when you are not using PLATO?

☐ Definitely ☐ Probably ☐ Not sure ☐ Probably not ☐ Definitely not

19. Were there a sufficient number of terminals available for your students to work on their own without sharing terminals?

☐ Yes, always ☐ More than half the time ☐ About half the time ☐ Less than half the time ☐ There were never enough terminals

20. What do you think about students sharing terminals?

☐ Very undesirable ☐ Undesirable but not serious ☐ Desirable ☐ Very desirable ☐ No opinion

21. Have system failures and/or red lighting been a problem for your PLATO class this semester?

☐ Yes, a major problem ☐ Yes, a minor problem ☐ No, not a problem

22. How many PLATO lessons have you designed or helped to design?

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 or more

23. How many PLATO lessons have you programmed?

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 or more

24. How difficult do you think it is to develop and produce a lesson on PLATO?

☐ Very difficult ☐ Moderately difficult ☐ Not difficult at all ☐ Not sure

25. How difficult do you regard the use of the TUTOR language?

☐ Very difficult ☐ Moderately difficult ☐ Not difficult at all ☐ I have not used the TUTOR language

26. To what degree have you experienced difficulty in obtaining lesson space for authoring?

☐ Great difficulty ☐ Some difficulty ☐ No difficulty ☐ I have never tried to obtain lesson space for authoring.

27. How helpful do you regard the University of Illinois Extension Course on the use of PLATO?

☐ Very helpful ☐ Moderately helpful ☐ Not helpful at all ☐ I have not taken such a course

28. How helpful do you regard the CERL subject matter coordinator and his or her staff?

☐ Very helpful ☐ Moderately helpful ☐ Not helpful at all ☐ I have had no contact with the CERL subject matter coordinator

29. How helpful do you regard the PLATO site coordinator and his or her staff?

☐ Very helpful ☐ Moderately helpful ☐ Not helpful at all

30. How helpful do you regard the course records (individual on-line student data) provided by PLATO?

☐ Very helpful ☐ Moderately helpful ☐ Not helpful at all ☐ I am not aware of such course records

31. How effective do you regard the PLATO subject matter meetings in identifying, designing, and developing new lessons?

☐ Very effective ☐ Moderately effective ☐ Not effective at all ☐ I have never attended such a meeting

32. How adequate are the number of PLATO lessons available for your students?

☐ Very adequate ☐ Adequate ☐ Inadequate ☐ Very inadequate ☐ Not sure

33. How adequate is the content of the lessons available for your students?

☐ Very adequate ☐ Adequate ☐ Inadequate ☐ Very inadequate ☐ Not sure

34. How adequate is the clarity of the material presented in the PLATO lessons available for your students?

☐ Very adequate ☐ Adequate ☐ Inadequate ☐ Very inadequate ☐ Not sure

35. How adequate is the use of examples and illustrations in the PLATO lessons available for your students?

☐ Very adequate ☐ Adequate ☐ Inadequate ☐ Very inadequate ☐ Not sure

36. How adequate is the help provided for students in the PLATO lessons available for your students?

☐ Very adequate ☐ Adequate ☐ Inadequate ☐ Very inadequate ☐ Not sure

37. In general, how difficult are the PLATO lessons for your students?

☐ Very difficult ☐ Difficult ☐ About right ☐ Easy ☐ Very easy

38. Have content and/or mechanical errors in the lessons been a problem for your PLATO students this semester?

content errors in the lessons	☐ Yes, a major problem	☐ Yes, a minor problem	☐ No, not a problem
mechanical errors in the lessons	☐ Yes, a major problem	☐ Yes, a minor problem	☐ No, not a problem

39. How difficult are the following components of PLATO for your students?

Signing on	☐ Very difficult	☐ Difficult	☐ About right	☐ Easy	☐ Very easy
Use of the index	☐ Very difficult	☐ Difficult	☐ About right	☐ Easy	☐ Very easy
Locating the correct lesson	☐ Very difficult	☐ Difficult	☐ About right	☐ Easy	☐ Very easy
Getting out of a lesson	☐ Very difficult	☐ Difficult	☐ About right	☐ Easy	☐ Very easy
Getting into a new lesson	☐ Very difficult	☐ Difficult	☐ About right	☐ Easy	☐ Very easy
Determining the correct answer for PLATO	☐ Very difficult	☐ Difficult	☐ About right	☐ Easy	☐ Very easy
PLATO vocabulary	☐ Very difficult	☐ Difficult	☐ About right	☐ Easy	☐ Very easy
Use of help-type keys	☐ Very difficult	☐ Difficult	☐ About right	☐ Easy	☐ Very easy
On-line tests	☐ Very difficult	☐ Difficult	☐ About right	☐ Easy	☐ Very easy
Typing	☐ Very difficult	☐ Difficult	☐ About right	☐ Easy	☐ Very easy
Signing off	☐ Very difficult	☐ Difficult	☐ About right	☐ Easy	☐ Very easy

EVALUATION OF PLATO - The faculty's own judgments are seen as an important input into the overall evaluation. On the basis of your knowledge of PLATO, we would appreciate your evaluative judgment on the following dimensions of the program.

++ = high positive impact
+ = positive impact
0 = no impact
- = negative impact
-- = high negative impact

What is PLATO's impact on the following?	++	+	0	-	--
student achievement	☐	☐	☐	☐	☐
student attitudes toward subject matter	☐	☐	☐	☐	☐
course completion rates	☐	☐	☐	☐	☐
quality of student-instructor interaction	☐	☐	☐	☐	☐
quality of student-student interaction	☐	☐	☐	☐	☐
faculty duties and responsibilities	☐	☐	☐	☐	☐

What do you think are the greatest strengths of PLATO?

What do you think are the greatest weaknesses of PLATO?

FACULTY QUESTIONNAIRE

Name ______________________________ Date ______________________________

Years of Teaching Experience ______________________

1. Do you have some knowledge of the PLATO program, either from your own experience or from conversations with others in the college?.................. ☐ Yes ☐ No

2. Have you observed PLATO in operation?.. ☐ Yes ☐ No

3. Have you ever operated a PLATO terminal?.. ☐ Yes ☐ No

4. Have you discussed PLATO with students?.. ☐ Yes ☐ No

5. Have you discussed PLATO with other faculty members?.............................. ☐ Yes ☐ No

6. Have you discussed PLATO with visitors to your college?............................ ☐ Yes ☐ No

7. Have you ever attended a PLATO orientation session?.................................. ☐ Yes ☐ No

8. Have you taught a class using PLATO?.. ☐ Yes ☐ No

9. Are you interested in using PLATO as part of your instruction?

☐ Very Interested ☐ Somewhat Interested ☐ Not sure ☐ Not Interested ☐ Definitely Not interested

FOR THE FOLLOWING STATEMENTS, PLEASE CHECK THE RESPONSE THAT IS CLOSEST TO YOUR OPINION.

10. My colleagues seem to be favorably impressed with PLATO........................ ☐ Agree ☐ Disagree

11. I'd like to learn more about PLATO but I just haven't had the time............ ☐ Agree ☐ Disagree

12. Students probably become more active in their own learning through the use of PLATO... ☐ Agree ☐ Disagree

13. PLATO is a passing fad... ☐ Agree ☐ Disagree

14. PLATO relieves instructors of many routine duties.................................. ☐ Agree ☐ Disagree

15. It would be difficult for an instructor to judge students' learning using PLATO... ☐ Agree ☐ Disagree

16. Some of my students seem to be favorably impressed with PLATO................. ☐ Agree ☐ Disagree

17. I don't think PLATO offers any lessons in the areas that I teach............... ☐ Agree ☐ Disagree

18. PLATO does not develop student interest in or appreciation of a subject as much as regular classroom instruction.......................... ☐ Agree ☐ Disagree

19. PLATO provides a greater opportunity for instructors to interact with students on an individual basis.. ☐ Agree ☐ Disagree

20. PLATO is dehumanizing for the students.. ☐ Agree ☐ Disagree

21. Working on the PLATO terminal would probably improve students' learning strategies in other courses.. ☐ Agree ☐ Disagree

22. I would feel comfortable using PLATO as part of my course instruction........ ☐ Agree ☐ Disagree

23. With PLATO, students receive less individual attention from the instructor... ☐ Agree ☐ Disagree

24. PLATO is one of the most significant developments in education today......... ☐ Agree ☐ Disagree

25. Breakdowns of the PLATO system disrupt students' learning.................. ☐ Agree ☐ Disagree

26. PLATO takes up valuable class time.. ☐ Agree ☐ Disagree

27. PLATO is a valuable resource for this institution.......................... ☐ Agree ☐ Disagree

28. PLATO suppresses student creativity in that it does not allow for student differences.. ☐ Agree ☐ Disagree

EVALUATION OF PLATO - The faculty's own judgments are seen as an important input into the overall evaluation. On the basis of your knowledge of PLATO, we would appreciate your evaluative judgment on the following dimensions of the program.

++ = high positive impact
+ = positive impact
0 = no impact
- = negative impact
— = high negative impact

What is PLATO's impact on the following?	++	+	0	-	—
student achievement..	☐	☐	☐	☐	☐
student attitudes toward subject matter..........................	☐	☐	☐	☐	☐
course completion rates...	☐	☐	☐	☐	☐
quality of student-instructor interaction........................	☐	☐	☐	☐	☐
quality of student-student interaction...........................	☐	☐	☐	☐	☐
faculty duties and responsibilities..............................	☐	☐	☐	☐	☐

PLATO LAB OBSERVATION

Observer: ____________ Date: ____________

College: ____________ Scheduled Time: ____________

Instructor: ____________ Observation Begins: ____________

Course/Section: ____________ Observation Ends: ____________

1. Total number of terminals in PLATO lab: ______

2. Number of operable terminals: ______

3. Session on PLATO: ______

4. Beginning of class period (note time): ______

5. For each of the following, indicate times in and out of the lab:

	IN	OUT	IN	OUT	IN	OUT
a) Teacher						
b) Site Coordinator						
c) Aide						
d) Other: ______						

6. If students are assigned to terminals, by whom are they assigned?

   a) ☐ Assigned by instructor
   b) ☐ Assigned by site coordinator
   c) ☐ Assigned by aide
   d) ☐ Terminals are not assigned

7. Number of students present from the scheduled class (after 30 min.): ______

8. Number of students using terminals but not in scheduled class (after 30 min.): ______

9. Number of terminals actually used by the students in the class (may be less than those available - after 30 min.): ______

10. Configuration of terminal use (after 30 min.):

    a) Number of students working alone: ______
    b) Number of doubles: ______
    c) Number of triples: ______
    d) Other: ______ ______

11. If students are taught to sign on, indicate by whom:

    ☐ Instructor
    ☐ Site coordinator
    ☐ Aide
    ☐ PLATO lesson
    ☐ Other: ______
    ☐ Students are not taught to sign on during this session.

12. Approximately how long does it take for the majority (50-75%) of the students to sign on?

☐ 1 - 2 minutes

☐ 3 - 5 minutes

☐ 6 -10 minutes

☐ more than 10 minutes

13. If any general instructions are given to the students during the class period, indicate the following:

By whom	Time	Comments

For items 14, 15, and 16, use the following categories:

0 - Never
1 - Small part of period
2 - Half period
3 - Most of period
4 - Whole period

14. For the instructor, indicate the following:

a) Gives help when requested	0	1	2	3	4
Students involved	0 None	1	2	3	4 All
b) Gives help when not requested	0	1	2	3	4
Students involved	0 None	1	2	3	4 All

For the site coordinator, indicate the following:

a) Gives help when requested	0	1	2	3	4
Students involved	0 None	1	2	3	4 All
b) Gives help when not requested	0	1	2	3	4
Students involved	0 None	1	2	3	4 All

For the aide, indicate the following:

a) Gives help when requested	0	1	2	3	4
Students involved	0 None	1	2	3	4 All
b) Gives help when not requested	0	1	2	3	4
Students involved	0 None	1	2	3	4 All

For other individuals (except students) indicate the following: Specify:____________________

a) Gives help when requested	0	1	2	3	4
Students involved	0 None	1	2	3	4 All
b) Gives help when not requested	0	1	2	3	4
Students involved	0 None	1	2	3	4 All

15. For the instructor, site coordinator, and aide, indicate their activities throughout the period (circle the appropriate number):

	Instructor	Site Coordinator	Aide
a) Circulates about the room	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4
b) Works at a free terminal	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4
c) Does work unrelated to PLATO	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4
d) Interacts with site coordinator	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4
e) Interacts with observer	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4
f) Interacts with instructor	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4
g) Interacts with aide	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4

16. Student to Student Interaction:

a) Brief verbal interchange	0 1 2 3 4
b) Prolonged verbal interchange	0 1 2 3 4
c) Movement	0 1 2 3 4

17. Students involved:

a) Brief verbal interchange	0 1 2 3 4 None All
b) Prolonged verbal interchange	0 1 2 3 4 None All
c) Movement	0 1 2 3 4 None All

	1	2	3
18. System failure occurs (indicate time):	________	________	________
System comes up (indicate time):	________	________	________

19. If terminals malfunction during the period, indicate:

Number of terminals:	________	________	________
Duration:	________	________	________
No malfunction:	________	________	________

20. If terminals that previously had malfunctioned come up during the period, indicate:

#	Time	Used (Yes/No)	Comments

21. Describe events when system failure occurs, terminals malfunction, or terminals become operable again (instructor, site coordinator, aides, students):

____

____

____

____

22. If students from class enter PLATO lab after the beginning of the scheduled period, note:

# Students	Time
________	________
________	________
________	________

23. If students from class leave PLATO lab before end of the scheduled period, note:

# Students	Time
________	________
________	________
________	________

24. End of class period (note time): ________

25. Number of students in the scheduled class who remain on PLATO 5 minutes beyond the end of the period:

____

26. Global Ratings of PLATO class:

a) Student attention	0 low	1	2	3	4 high
b) Student attitude	0 negative	1	2	3	4 positive
c) Student-student interaction	0 none	1	2	3	4 a great deal
d) Lesson access problems	0 none	1	2	3	4 many
e) Facility with terminals	0 poor	1	2	3	4 excellent

27. Describe any examples of help provided to students that you observed:

____

____

____

____

____

____

____

28. Observer Comments (problems, unusual occurences, disruptions, noise level, etc.):

____

____

____

____

____

____

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INDIVIDUAL STUDENT OBSERVATION

Observer ______________________ Student Identification ______________

College ______________________ Date ______________

Instructor ______________________ Observation Begins ______________

Course & Section ______________________ Number students at terminals ______________

1. System and terminal operating (number of minutes): __________

Comments: ____

____

2. Facility with terminal	0	1	2	3	4
	poor				excellent
3. Uses supplementary materials	0	1	2	3	4
	never				always
4. Takes notes/copies from terminal	0	1	2	3	4
	never				always
5. Away from terminal	0	1	2	3	4
	never				always

For items 6-15, indicate number of times:

6. Requests help from instructor, site coordinator, aide, and/or other	0	1	2	3	4+
7. Requests help from another student	0	1	2	3	4+
8. Receives help from instructor	0	1	2	3	4+
9. Receives help from site coordinator	0	1	2	3	4+
10. Receives help from aide, other	0	1	2	3	4+
11. Receives help from another student	0	1	2	3	4+
12. Interrupted by instructor	0	1	2	3	4+
13. Interrupted by site coordinator	0	1	2	3	4+
14. Interrupted by aide, other	0	1	2	3	4+
15. Interrupted by another student	0	1	2	3	4+

Student Attitude/Behavior:

16. 0 1 2 3 4
inattentive — very attentive

17. 0 1 2 3 4
bored — enthusiastic

18. 0 1 2 3 4
tense — relaxed

19. 0 1 2 3 4
inactive — active

20. 0 1 2 3 4
not confused — very confused

21. 0 1 2 3 4
not frustrated — very frustrated

22. Describe any examples of help provided to students that you observed: